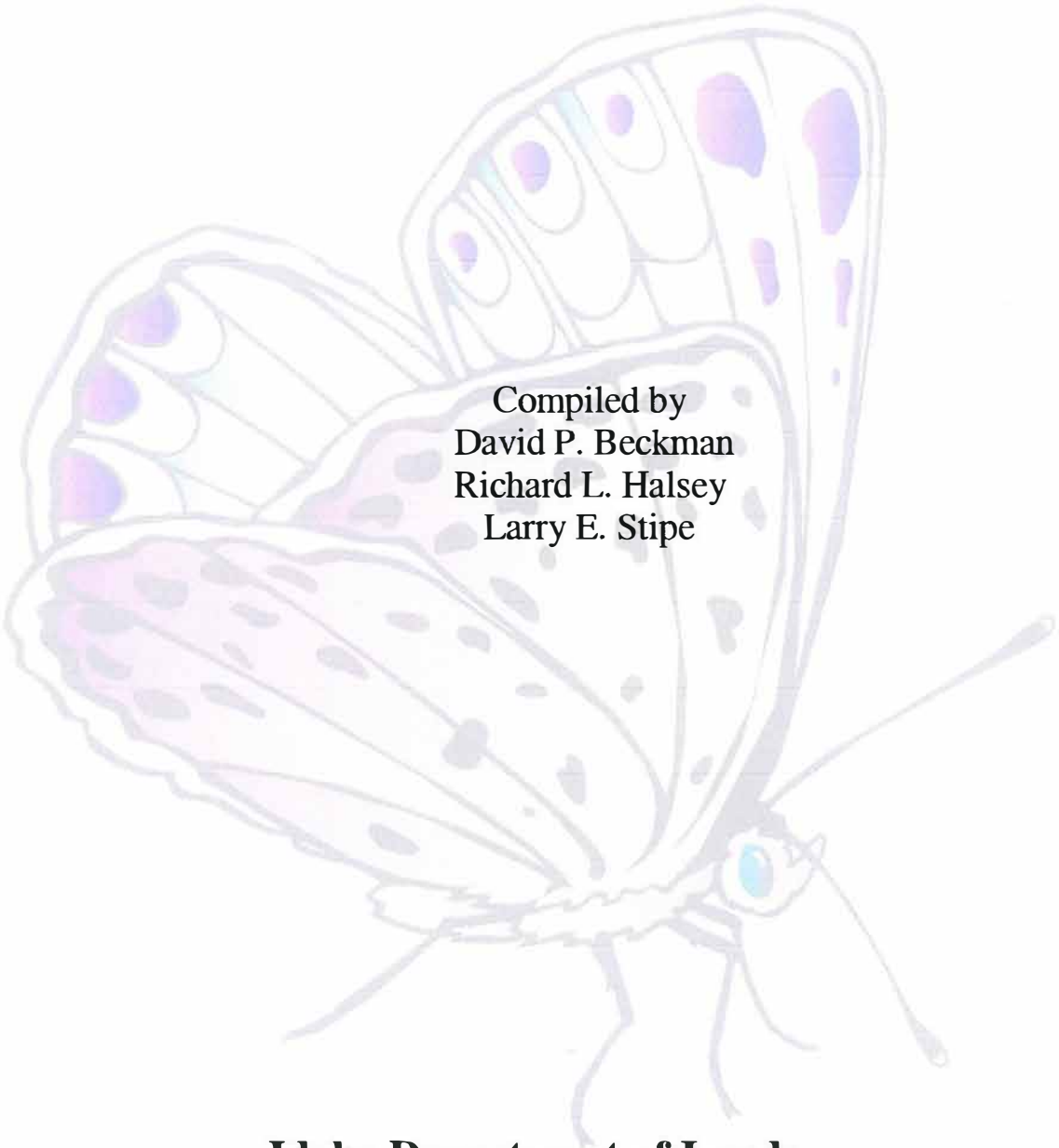
IDAHO FOREST INSECT AND DISEASE CONDITIONS SUMMARY

2001 – 2002

IDAHO Department of Lands
USDA Forest Service
Northern & Intermountain Region
IDL Report No. 2004-7

IDAHO FOREST INSECT & DISEASE CONDITIONS 2001-2002



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IDL Report No. 2004-7

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INTRODUCTION

This report summarizes major insect and disease activity on forested lands of all ownerships within the State of Idaho for 2001 & 2002. Much of the information for this report was derived from aerial and ground surveys and associated detection and evaluation activities by insect and disease specialists within the USDA Forest Service and the Idaho Department of Lands. Acres and numbers of trees reported in tables are only estimates. Likewise, maps outlining areas of major insect infestations only provide general locations of defoliation and mortality.

Forest insects, bark beetles and defoliating insects are featured in this report because they commonly occur as "outbreaks" and are readily observed from aerial surveys. Effects of most significant forest diseases are not readily assessed from the air. Therefore, only general information and observations on diseases are reported.

Insects and diseases affect the health of forests in many ways. A broader, more comprehensive discussion of these effects and their significance is contained in "Health of Idaho's Forests, A Summary of Conditions, Issues and Implications." National Forest designations include all adjacent state and private ownerships as well as federal lands.

CONDITIONS IN BRIEF

FOREST INSECTS

Tree mortality attributed to mountain pine beetle continues to increase throughout Idaho, for the past two years with 1,270,400 dead pines detected in 2001, 2,534,850 in 2002 in all pine species, on all ownerships. The largest outbreaks were located once again on the Nez Perce National Forest in 2001 with 951,300 dead lodgepole pine and in 2002 with 1,225,250 dead lodgepole pine. Tree mortality attributed to pine engraver beetle and western pine beetle decreased throughout Idaho in 2001 with 3,200 killed trees but in 2002 jumped up to 14,100 trees killed in all tree species, on all ownerships. The largest outbreaks were located on State and Private Lands throughout Idaho. Tree mortality attributed to spruce beetle doubled throughout Idaho in 2001 to just over 5,000 killed trees and then decreased in 2002 to only 830 dead spruce on all ownerships. The largest outbreaks were located on the Boise National Forest in 2001 with 3,500 dead spruce trees. Tree mortality attributed to Douglas-fir beetle decreased throughout Idaho from 394,000 in 2000 on all ownerships, to 257,700 dead Douglas-fir in 2001 and to 97,700 dead trees in 2002. The largest outbreaks were located on the Coeur d'Alene National Forest in 2001 with 50,700 dead Douglas-fir and only 8,800 dead trees in 2002. The largest outbreak in 2002 was on the Targhee-Caribou NF in SE Idaho with 23,200 dead trees. Tree mortality attributed to the fir engraver increased throughout Idaho from that 2,800 in 2000 to about 9,900 killed trees in 2001. Then a large increase in 2002 to 130,400 killed trees on all ownerships. The largest outbreaks were located on State and Private Lands both years. Tree mortality of subalpine fir was divided between north and south Idaho with the mortality attributed to western balsam bark beetle all in the north and tree mortality in southern Idaho attributed to a complex of subalpine fir mortality agents. Tree mortality attributed to western balsam bark beetle increased throughout Idaho in 2001 with 181,750 dead trees, then decreased to 60,000 trees killed in 2002 on all ownerships. The largest outbreaks were located on the Nez Perce National Forest in 2001 with 84,150 dead subalpine fir trees and another 27,000 killed subalpine in 2002. Tree mortality attributed to the subalpine fir complex increased in 2001, then decreased slightly throughout Idaho in 2002 with approximately 66,650 dead trees in 2001 and 55,000 dead trees in 2002 on all ownerships. The largest outbreaks were located on the Sawtooth National Forest in 2001 with 40,000 dead subalpine fir trees and 28,000 dead trees in 2002. In northern Idaho aerial survey results reported 141,873 acres defoliated by Douglas-fir tussock moth near the town of Potlatch, Idaho on the Palouse Ranger District of the Clearwater National Forest and adjacent state, private, and reservation lands. Also approximately 17,000 acres of defoliation were observed in the Owyhee Mountains in southwestern Idaho. In 2002 the defoliation in northern Idaho dropped to only 5,400 acres. In the Owyhee Mountains the outbreak appears to be over. There were 1,360 acres of defoliation reported in southwestern Idaho. There was visible defoliation from western spruce budworm in 2001, 3,800 acres on the Boise and Targhee NF's and 6,900 acres in northern Idaho and another 15,175 in southern Idaho in 2002. Subalpine fir mortality due mainly to the balsam woolly adelgid was mapped over 51,550 acres in 2001, 85,400 acres in 2002 mostly on the St Joe, Clearwater and Nez Perce National Forests and adjacent state, private and BLM lands. There was no visible defoliation caused by larch casebearer in 2001 or 2002.

FOREST DISEASES

Impacts caused by forest pathogens are grossly underestimated by aerial survey methods since majority of infected trees can't be detected. Other methods primarily utilizing ground survey methods are most effective at determining effects of many pathogens.

FOREST INSECTS

BARK BEETLES

MOUNTAIN PINE BEETLE

2001 - In Idaho, MBP mortality increased for the seventh straight year with 1,270,400 trees killed (Table 1) on 165,850 acres compared to nearly 485,950 trees killed in 2000. Mortality occurred in all pine species, lodgepole, ponderosa, white pine, and whitebark pine. Ninety-five percent (1,208,300) of beetle-killed trees were in lodgepole pine (Table 1) and 1,092,475 of those trees on federal lands. MPB has once again become the most frequently encountered and damaging bark beetle in the State. Hundreds of thousands of acres of lodgepole pine are becoming increasingly susceptible, warmer and drier weather conditions are proving to be more and more conducive to beetle survival. Both phenomena have enabled beetle populations to increase significantly in the last few years. Populations are still active in lodgepole pine stands in several areas and may be expected to increase throughout Idaho. The largest outbreak in Idaho once again was located on the Nez Perce NF in lodgepole pine with just over 951,300 trees killed (Table 1) on just under 72,000 acres. The largest outbreaks in southern part of the state were located in lodgepole pine stands on the Sawtooth National Recreation Area and the Salmon-Challis NF in central Idaho with a combined total of just over 91,000 trees killed (Table 1), up from 20,000 in 2000. Impact was most severe to the recreation and fisheries resources. Trees along the Salmon River and Redfish Lake provide shade and scenic beauty for recreationists as well as shade to moderate temperatures for spawning endangered salmon species. There were large increases of MPB on State and Private Lands in Idaho with 50,600 trees killed (Table 1) and also on BLM lands with 65,200 trees killed (Table 1), both in lodgepole pine. Groups of mountain pine beetle-attacked western white pine (4,875 trees killed) were also found scattered throughout northern Idaho. Mortality of whitebark and limber pine attributed to MPB infestation continued to increase in 2001, to just fewer than 55,375 trees killed (Table 1, Figure 1). Significant amounts of whitebark pine mortality, caused by MPB, were recorded on the Kaniksu NF, not far south of the US/Canada border and on the Payette NF with 14,900 trees killed (Table 1), on 4,800 acres. Small isolated infestations are located on other Forests, BLM lands and State and Private Lands. In Southern Idaho mortality of whitebark and limber pine attributed to MPB attack increased from 6,600 trees killed in 2000 to 23,910 trees killed (Table 1), in 2001.

2002 - In Idaho, MPB populations once again increased significantly, for the eighth straight year. In 2002, nearly 339,325 acres were infested, on which an estimated 2,534,850 trees were killed (Table 1, Figure 1). In 2001, almost 1,270,400 trees were killed (Table 1, Figure 1) on approximately 165,850 acres (Table 1)--including all host species, found on lands of all ownerships. Almost ninety-six percent of mapped MPB killed trees were in lodgepole pine. The largest outbreak in Idaho exists on the Nez Perce NF in north-central Idaho, where on 60,640 acres, 1,225,250 red lodgepole trees (Table 1) were mapped. Another 1,037,600 lodgepole pine tree was killed (Table 1) on the Sawtooth National Recreation Area and Salmon-Challis NF's in central Idaho. Impact was most severe along the Salmon River and Redfish Lake where killed lodgepole once provided shade and scenic beauty for recreationists as well as shade to moderate temperatures for spawning endangered salmon species. Mortality of whitebark and limber pine attributed to MPB infestation continued to increase in 2002, to just over 64,100 trees killed (Table 1, Figure 1) on 18,550 acres. The largest outbreak was located on the Kaniksu NF with just under 40,700 trees killed (Table 1) on 12,700 acres, not far south of the US/Canada border. Most of this mortality was in high elevation whitebark pine stands in Idaho where the rare pine stands are declining from a combination of white pine blister rust infections; interruption of normal fire cycles; invasion of shade tolerant species and consequent overstocking; over maturation of stands; and the MPB. These high elevation ecosystems are highly valued and important for watershed stability, recreation, and wildlife purposes. The heavy whitebark pine seeds are also an important food source for numerous birds and small mammals, as well as food for the threatened and endangered grizzly bear. Groups of mountain pine beetle-attacked western white pine jumped from 4,875 trees killed in 2001 to just over 38,000 trees killed (Table 1) in 2002, with 33,800 of those trees killed on the Coeur d'Alene NF reporting area, on just under 17,600 acres. Beetle-caused mortality in ponderosa pine stands is not extreme; but is of concern in some areas. A total of (5,560 ponderosa pine), were killed (Table 1) on just over 4,700 acres.

Year	MPB Killed Trees	Acres Infested	Year	MPB Killed Trees	Acres Infested
2002	2,534,856	339,322	1997	62,914	54,667
2001	1,270,402	165,858	1996	41,073	33,098
2000	485,957	123,225	1995	16,862	17,850
1999	127,605	83,818	1994	8,464	7,045
1998	84,942	81,649	Total	4,633,075	923,185

Table 1. Idaho Statewide summary; annual mountain pine beetle (**MPB**) mortality

		MPB (white pine) Estimated Mortality			**MPB** (ponderosa pine) Estimated Mortality			**MPB** (lodgepole pine) Estimated Mortality			**MPB** (whitebark pine) Estimated Mortality		
AREA	Year	Acres Infested	Trees	MBF Volume	Acres Infested	Trees	MBF Volume	Acres Infested	Trees	MBF Volume	Acres Infested	Trees	MBF Volume
Bitterroot	2001	0	0	0.0	0	0	0.0	2	5	0.5	0	0	0.0
	2002	0	0	0.0	0	0	0.0	6	20	1.8	0	0	0.0
Boise	2001	0	0	0.0	0	0	0.0	552	1,857	118.8	2,632	5,578	613.6
	2002	0	0	0.0	0	0	0.0	3,389	11,244	719.6	1,898	10,217	1,123.9
Clearwater	2001	492	254	101.6	87	18	1.4	1,317	2,194	197.5	0	0	0.0
	2002	212	95	38.0	41	5	0.4	2,111	1,914	172.3	0	0	0.0
Coeur d'Alene	2001	153	45	18.0	18	27	2.2	659	799	71.9	6	8	0.9
	2002	10,242	33,798	7.2	2	1	0.1	2,035	16,221	1,459.9	0	0	0.0
Kaniksu	2001	5,320	2,999	1,199.6	16	48	3.8	5,251	6,601	594.1	10,235	30,486	3,353.5
	2002	4,744	2,817	1,126.8	2,013	2,320	185.6	14,246	16,455	1,481.0	12,678	40,692	4,476.1
Kootenai	2001	46	66	26.4	0	0	0.0	0	0	0.0	0	0	0.0
	2002	50	66	26.4	0	0	0.0	2	11	1.0	0	0	0.0
Nez Perce	2001	61	82	32.8	414	588	47.0	71,963	951,314	85,618.3	824	439	48.3
	2002	187	186	74.4	1,079	1,198	95.8	160,640	1,225,254	110,272.9	273	223	24.5
Payette	2001	0	0	0.0	0	0	0.0	73	295	18.9	4,811	14,876	1,636.4
	2002	0	0	0.0	0	0	0.0	858	3,890	249.0	391	2,772	304.9
Salmon-Challis	2001	0	0	0.0	288	572	22.8	7,606	19,431	1,243.6	130	465	51.2
	2002	0	0	0.0	325	636	25.4	17,559	193,435	314,943.1	537	1,787	196.6
Sawtooth	2001	0	0	0.0	0	0	0.0	23,428	71,638	4,584.8	784	2,933	322.6
	2002	0	0	0.0	0	0	0.0	52,072	844,172	54,027.0	1,755	4,922	541.4
St. Joe	2001	1,497	1,016	406.4	515	345	27.6	12,950	38,310	3,447.9	0	0	0.0
	2002	465	249	99.6	441	284	22.7	16,473	20,761	1,868.5	0	0	0.0
Targhee-Caribou	2001	0	0	0.0	0	0	0.0	10	30	1.9	10	30	3.3
	2002	0	0	0.0	0	0	0.0	1,897	6,385	408.6	884	3,366	370.3
Indian Res.	2001	0	0	0.0	0	0	0.0	2	5	0.5	0	0	0.0
	2002	0	0	0.0	0	0	0.0	68	149	9.5	0	0	0.0
BLM	2001	31	25	10.0	2	2	0.2	6,348	65,216	5,869.4	47	293	32.2
	2002	112	86	34.4	2	1	0.1	12,317	6,534	583.6	10	10	1.1
Other Lands	2001	377	388	155.2	133	249	7.7	6,661	50,609	4,472.5	107	266	29.3
	2002	1,567	768	307.2	809	1,114	83.7	14,808	80,666	6,775.0	124	132	14.6
Idaho Totals	2001	7,977	4,875	195.0	1,473	1,849	112.7	136,822	1,208,304	106,240.6	19,586	55,374	6,091.3
	2002	17,579	38,065	1,714.0	4,712	5,559	413.8	298,481	2,427,111	492,972.8	18,550	64,121	7,053.4

Idaho MPB Mortality

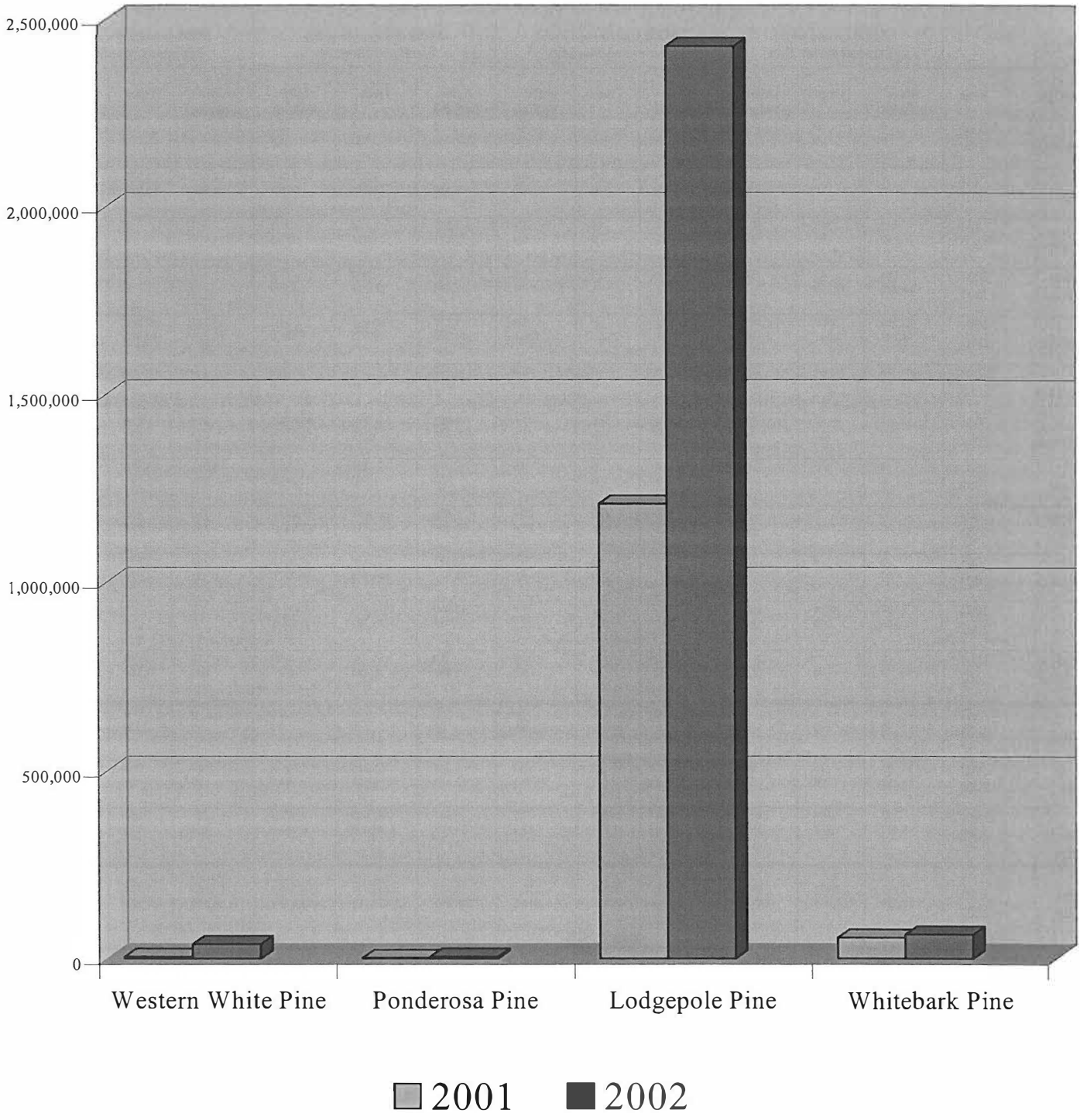


Figure 1. Mountain Pine Beetle Mortality
By Host Species as determined by
Aerial Surveys in Idaho 2001 – 2002

PINE ENGRAVER

2001 - Although noted at very low levels, most pine engraver beetle activity in the State, in 2001, was recorded in ponderosa and lodgepole pine stands in northern Idaho. Total mortality in 2001 increased slightly from the estimated 1,000 trees killed in 2000 on about 590 acres, to a total of approximately 1,300 trees killed (Table 2) in 2001—of both species—on just fewer than 400 acres. While recorded mortality did increase somewhat in 2001, we anticipated the increase may have been higher because of a continuation of unusually warm and dry weather for the past few years in most reporting areas. We may yet experience increases in beetle-killed trees due to environmental conditions and the number of fire-affected ponderosa pine stands. State and Private Lands in Idaho, recorded the most engraver beetle-killed trees - 900 killed trees (Table 2) in lodgepole and ponderosa pine. An estimated 200 trees were killed (Table 2) on about 150 acres on the Clearwater NF reporting area.

2002 - Although still at relatively low levels considering the abnormally dry conditions, pine engraver beetle activity increased somewhat in 2002. Most beetle-caused mortality was recorded in ponderosa and lodgepole pine stands in northern Idaho. Total mortality in 2002 is estimated to have increased from about 1,290 killed trees on 390 acres in 2001 to approximately 2,465 killed trees (Table 2) on 1,220 acres in 2002. While recorded mortality increased some in 2002, we anticipated the increase may have been higher because of a continuation of unusually warm and dry weather for the past few years in most reporting areas. We may yet experience increases in beetle-killed trees due to environmental conditions and the number of fire-affected ponderosa pine stands. State and Private Lands, in northern Idaho, recorded the most engraver beetle-killed trees, just over 2,200 (Table 2), on some 830 acres. The Clearwater NF reporting area recorded just over 185 killed trees from the pine engraver beetle.

WESTERN PINE BEETLE

2001 - Ponderosa pine mortality attributed to western pine beetle (WPB) increased slightly in 2001; more acres were affected also. In 2000, about 1,725 beetle-killed trees (Table 2) had been recorded on 1,350 acres. That increased to just over 2,265 acres; with just over 1,900 trees were killed (Table 2) in 2001. Most mortality, just under 970 trees killed—on nearly 600 acres—was observed on the State and Private Lands, in northern Idaho. Elsewhere in the State, observations detected a total of 565 trees killed by WPB this year on the Salmon-Challis, Payette and Boise NF's in southern Idaho. In other reporting areas, western pine beetle-caused mortality was light and quite scattered. There remains the potential for WPB populations to increase in 2002. Large amounts of fire-weakened ponderosa pines, resulting from widespread fires in 2000 and drier-than-normal conditions, have created conditions conducive to beetle population survival.

2002 - Ponderosa pine mortality attributed to western pine beetle recorded in 2002 increased substantially from the level recorded in 2001. In 2002, beetle-caused mortality, just over 15,000 killed trees (Table 2) occurred on about 8,600 acres—up from approximately, 1,900 killed trees on 2,265 acres in 2001. Most mortality was observed on State and Private Lands and on the Payette NF reporting area. For the most part, throughout the State, western pine beetle-caused mortality was light and quite scattered. There remains the potential for western pine beetle populations to increase in 2003. Large amounts of susceptible ponderosa pines, resulting from fires in 2000 and drier-than-normal conditions, have created conditions conducive to beetle population survival and expansion.

SPRUCE BEETLE

2001 - Spruce beetle populations remained low throughout the State in 2001 with a total of only 5,068 killed trees (Table 2, Figure 2) on just over 2,280 acres State wide, but making small advances in southern Idaho. Most of this mortality occurred as small and scattered groups of beetle-killed Engelmann spruce on the Boise NF reporting areas with just over 3,500 killed trees on just over 1,600 acres. No significant mortality was observed in other areas of Idaho reporting areas.

2002 - Spruce beetle populations once again remained very low throughout the State in 2002, with infested areas decreasing statewide, over the 2001 levels. In northern Idaho there were only 205 trees killed on just over 140 acres (Table 2). Most occurred as small and scattered groups on the Idaho Panhandle and Clearwater reporting areas. In southern Idaho there were a total of just over 575 trees killed over 265 acres (Table 2) with 345 those killed trees on the Boise NF reporting area and only 200 killed trees on the Sawtooth NF reporting area. For a total of just over 830 trees killed (Table 2, Figure 2) on just over 445 acres statewide. No significant mortality was observed in any other Idaho reporting areas.

Table 2. Idaho Statewide summary; annual bark beetle mortality by reporting area.

		Pine Engraver Beetle Estimated Mortality (PP&LPP)			Western Pine Beetle Estimated Mortality			Spruce Beetle Estimated Mortality		
AREA	Year	Acres Infested	Trees	MBF Volume	Acres Infested	Trees	MBF Volume	Acres Infested	Trees	MBF Volume
Bitterroot	2001	0	0	0.0	2	3	1.2	4	7	2.8
	2002	0	0	0.0	0	0	0.0	0	0	0.0
Boise	2001	0	0	0.0	160	320	128.0	1,632	3,528	1,693.4
	2002	0	0	0.0	555	1,026	564.3	105	345	164.9
Clearwater	2001	151	200	4.0	56	28	11.2	38	35	14.0
	2002	343	186	3.7	320	298	119.2	65	88	35.2
Coeur d'Alene	2001	0	0	0.0	14	34	13.6	31	37	14.8
	2002	47	62	1.6	57	47	18.8	6	3	1.2
Kaniksu	2001	16	75	1.9	1,220	245	98.0	81	130	52.0
	2002	0	0	0.0	13	20	8.0	33	91	36.4
Kootenai	2001	0	0	0.0	0	0	0.0	0	0	0.0
	2002	0	0	0.0	0	0	0.0	0	0	0.0
Nez Perce	2001	61	82	2.1	8	5	2.0	55	48	19.2
	2002	0	0	0.0	157	155	62.0	4	2	0.8
Payette	2001	0	0	0.0	104	220	88.0	211	538	258.2
	2002	0	0	0.0	595	1,144	629.2	5	10	4.8
Salmon-Challis	2001	0	0	0.0	45	25	13.8	60	301	143.9
	2002	0	0	0.0	180	43	23.7	10	15	7.2
Sawtooth	2001	0	0	0.0	0	0	0.0	70	240	114.7
	2002	0	0	0.0	239	180	99.0	147	205	98.0
St. Joe	2001	0	0	0.0	4	2	0.8	4	2	0.8
	2002	0	0	0.0	4	7	2.8	33	21	8.4
Targhee-Caribou	2001	0	0	0.0	0	0	0.0	30	110	52.6
	2002	0	0	0.0	0	0	0.0	0	0	0.0
Indian Res.	2001	16	30	0.8	40	46	18.4	0	0	0.0
	2002	0	0	0.0	328	613	245.2	0	0	0.0
BLM	2001	0	0	0.0	10	12	4.8	0	0	0.0
	2002	0	0	0.0	173	347	163.3	0	0	0.0
Other Lands	2001	147	900	21.2	602	966	400.5	65	92	42.3
	2002	833	2,217	55.2	5,983	7,779	3,371.4	37	53	23.2
Idaho Totals	2001	391	1,287	30.0	2,265	1,906	780.3	2,281	5,068	2,408.7
	2002	1,223	2,465	60.5	8,604	11,659	5,306.9	445	833	380.1

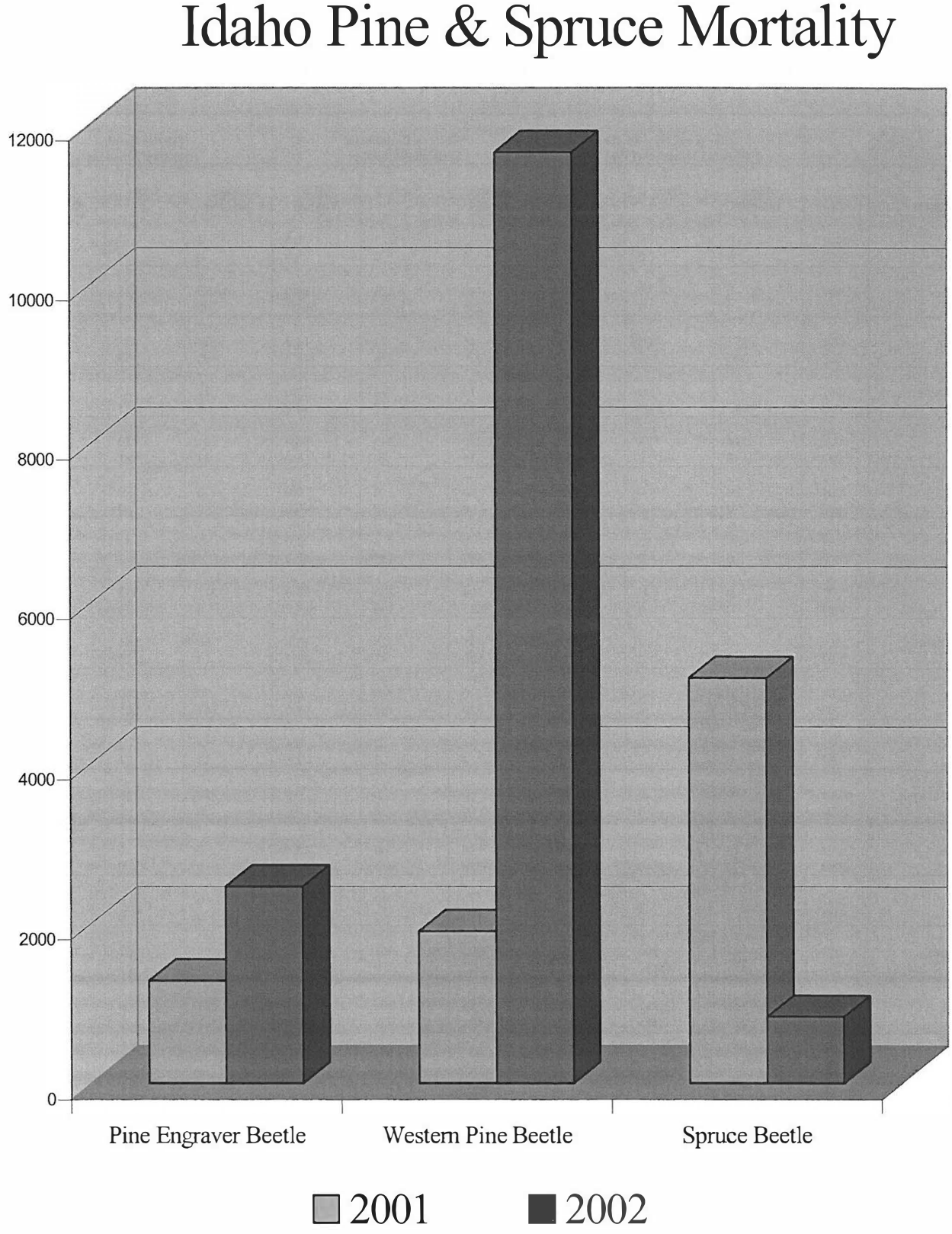


Figure 2. Pine and Spruce Mortality
By Bark Beetle Species as determined by
Aerial Surveys in Idaho2001--2002

DOUGLAS-FIR BEETLE

2001 - As expected, Douglas-fir beetle (DFB) caused tree mortality decreased again in 2001 to just over 257,700 killed trees (Table 3, Figure 3) state-wide. These trees were actually attacked by the beetle in 2000, but most crowns didn't fade until 2001. Statewide infested acres decreased from about 171,300 in 2000 to 135,700 acres in 2001. Most of the decrease occurred on the Coeur d'Alene NF reporting area, from 105,300 killed trees in 2000, to 50,700 killed trees (Table 3) on 39,700 acres in 2001. On the Bitterroot, Clearwater, Kaniksu, and the Targhee-Caribou reporting areas, there were around 30,000 killed trees (Table 3) each on these reporting areas in 2001.

2002 – The Douglas-fir Beetle (DFB) estimated mortality for 2002 was down to 97,700 killed trees on 52,800 acres (Table 3, Figure 3). With Douglas-fir beetle populations continuing a gradual decline in northern Idaho, although populations are still high in some areas, with the Clearwater NF reporting area having over 13,300 killed trees (Table 3) in 2002. Beetle populations are still high on Forests that had significant acreages affected by fire in 2000. In other areas, beetle populations remained high because environmental conditions were so favorable, despite higher moisture in some parts of the State. Throughout the State, more than 135,700 acres were infested by Douglas-fir beetle in 2001. Those figures were reduced by more than half in 2002—to just fewer than 52,800 acres. While the area affected by Douglas-fir beetle in northern Idaho has declined to approximately 36,500 acres. The Idaho Panhandle National Forests still had many acres containing beetle-killed trees, but few areas were found with current activity. Similar conditions were found on the Clearwater NF reporting area. The Targhee-Caribou NF reporting areas had some of the more active beetle populations in the State, with just over 23,200 killed trees (Table 3), the infested area increased to about 10,400 acres. Many areas in northern Idaho forested by mature Douglas-fir stands still harbored some level of Douglas-fir beetle-caused mortality. Statewide, more than 356,000 beetle-killed Douglas-fir have been recorded within the past two years.

FIR ENGRAVER

2001 - Fir engraver-caused mortality in grand fir stands increased in Idaho. The total grand fir killed by fir engraver increasing to almost 9,900 trees killed (Table 3, Figure 3) on 13,800 acres State-wide compared to only 2,860 killed trees on 2,400 acres in 2000. Most of the current mortality 7,740 killed trees (Table 3) occurred on State and Private Lands. Nearly 1,375 trees killed (Table 3) on the Coeur d'Alene NF reporting area. Northern Idaho also has a high amount of root disease that predisposes grand fir to fir engraver attack. No significant mortality was observed in southern Idaho.

2002 - Fir engraver-caused mortality in grand fir stands increased significantly in northern Idaho in 2002. We believe the increased mortality is related to the on-going droughty conditions found in much of the State. Total infested area exceeded 130,400 killed trees on 112,000 acres—up from slightly less than 13,800 acres in 2001. Mostly on State and Private Lands (65,750 killed trees) in Northern Idaho and to a lesser extent on the Nez Perce NF (38,400 killed trees) in north-central Idaho. Moisture deficits continued throughout the State in 2002 and the winter of 2002-2003. Fir engraver populations will likely remain high until moisture conditions return to normal. Northern Idaho also has a high amount of root disease in many grand fir stands that increases susceptibility to fir engraver attack. However, outbreaks are usually associated with droughts. Payette National Forest in southwestern Idaho (2,300 trees on 1,240 acres), Tree mortality caused by this insect was also observed on private land, 1,800 trees on 935 acres in southern Idaho. Only minor amounts were observed on other reporting areas in southern Idaho.

WESTERN BALSAM BARK BEETLE/ SUBALPINE FIR COMPLEX

2001 - The area of subalpine fir "decline" quaddrupaled in Idaho, in 2001 statewide. Several agents, notably root diseases and secondary bark beetles, are often found to be involved in the complex of pests causing this decline. Western balsam bark beetle *(Dryocoetes confusus)* appears to be the most commonly observed organism in the "complex". Over 248,400 subalpine fir were killed trees on almost 75,000 acres (Table 3, Figure 3) in 2001, compared to 58,600 killed trees on 52,700 acres in 2000. The largest outbreaks occurred on the Nez Perce NF reporting area, with 84,150 killed trees (Table 3) on 20,700 acres and on the Sawtooth NF reporting area, with another 40,000 killed trees (Table 3) on just over 6,000 acres. While the number of killed trees and infested acres increased, in most of the reporting areas of Idaho, the intensity of tree killing appeared to increase also. Ground examinations suggest a complex of factors are involved in this mortality. These factors include: twig beetles, secondary bark beetles, wood borers, fir engraver beetles, root diseases, cankers, rusts, and environmental conditions.

2002 - WBBB/SAF complex populations decreased in 2002. Subalpine fir mortality decreased by half in 2002 with an estimated 115,000 trees killed (Table 3) on about 75,000 state wide. In 2001, an estimated 248,400 red subalpine fir trees were recorded on 75,000 acres. Much of the mortality occurring on these high-elevation sites results from varying combinations of root diseases, bark beetles, and possibly other factors such as climatic change. The most significant factor, however, is thought to be mortality directly or indirectly caused by western balsam bark beetle (*Dryocoetes confusus*). The pathogenic fungus carried by western balsam bark beetle, *Ophiostoma dryocoetidis*, appears to cause mortality even when trees are only lightly attacked by the beetles. Most of the current tree mortality occurred on the Nez Perce National Forests in northern Idaho. Other forests with significant subalpine fir mortality include the Sawtooth National Forest and BLM Lands throughout Idaho. Decline and die-off of subalpine fir started in the late 1980's. Peak mortality periods occurred during the mid-1990's when over a million trees were affected by this complex. Although there are a number of pathogens involved in this complex, the primary insect causing subalpine fir mortality is the western balsam bark beetle, *Dryocoetes confuses.* Drought, heat stress, and winter drying, compounded by overstocked and overmature stand conditions also contribute to subalpine fir mortality.

Table 3 Idaho Statewide summary; annual bark beetle mortality by reporting area.

		Douglas-fir Beetle Estimated Mortality			Fir Engraver Estimated Mortality			Western Balsam Bark Beetle Estimated Mortality			Subalpine fir Complex Estimated Mortality		
AREA	Year	Acres Infested	Trees	MBF Volume	Acres Infested	Trees	MBF Volume	Acres Infested	Trees	MBF Volume	Acres Infested	Trees	MBF Volume
Bitterroot	2001	24,308	33,063	11,572.1	0	0	0.0	0	0	0.0			
	2002	3,546	8,444	2,955.4	0	0	0.0	0	0	0.0			
Boise	2001	3,522	11,604	1,647.8	0	0	0.0				243	1,649	181.4
	2002	1,883	6,204	2,171.4	265	991	188.3				263	970	106.7
Clearwater	2001	13,780	29,555	10,344.3	94	120	24.0	4,306	6,844	1,368.8			
	2002	7,320	13,301	4,655.4	1,449	2,056	411.2	2,246	3,616	397.8			
Coeur d'Alene	2001	39,699	50,707	17,747.5	1,864	1,373	274.6	552	621	124.2			
	2002	9,274	8,862	3,101.7	2,058	2,457	491.4	2,302	7,702	847.2			
Kaniksu	2001	14,811	34,174	11,961.0	156	211	42.2	25,013	37,644	7,528.8			
	2002	5,882	9,125	3,193.8	10,297	13,963	2,792.6	18,547	19,786	2,176.5			
Kootenai	2001	284	825	288.8	0	0	0.0	4	10	2.0			
	2002	193	292	102.2	0	0	0.0	0	0	0.0			
Nez Perce	2001	11,162	23,234	8,131.9	75	105	21.0	20,704	84,149	16,829.8			
	2002	3,544	7,933	2,776.6	15,676	38,397	7,679.4	27,746	26,966	2,966.3			
Payette	2001	2,059	6,250	887.5	0	0	0.0				1,454	4,700	517.0
	2002	290	965	137.0	1,237	2,323	441.4				812	1,498	164.8
Salmon-Challis	2001	5,404	8,535	1,212.0	0	0	0.0				3,660	13,693	1,506.2
	2002	2,259	3,983	565.6	0	0	0.0				5,646	16,285	1,791.4
Sawtooth	2001	1,285	4,402	625.1	0	0	0.0				6,065	39,921	4,391.3
	2002	1,664	4,390	623.4	15	22	4.2				11,353	28,129	3,094.2
St. Joe	2001	2,094	3,788	1,325.8	67	64	12.8	6,727	30,123	6,024.6			
	2002	2,427	4,387	1,570.5	2,044	2,230	446.0	974	641	70.5			
Targhee-Caribou	2001	6,395	31,375	4,455.3	0	0	0.0				1,337	5,727	630.0
	2002	10,402	23,242	3,300.4	0	0	0.0				3,330	7,056	776.2
Indian Res.	2001	158	361	82.7	104	156	31.2	0	0	0.0	50	130	14.3
	2002	116	183	37.1	300	548	109.6	0	0	0.0	380	740	81.4
BLM	2001	2,737	5,055	1,509.1	80	121	24.2	2,774	17,505	1,925.6	35	75	8.3
	2002	474	963	291.5	1,668	1,658	331.6	12	18	2.0	30	40	4.4
Other Lands	2001	8,002	14,785	4,178.2	11,320	7,744	1,548.8	1,602	4,881	536.9	314	764	84.0
	2002	3,494	5,412	1,740.1	76,930	65,755	13,129.5	1,019	1,353	148.8	116	236	26.0
Idaho Totals	2001	135,700	257,713	75,969.1	13,760	9,894	1,978.8	61,682	181,777	34,340.7	13,158	66,659	7,332.5
	2002	52,768	97,686	27,222.1	111,939	130,400	26,025.2	52,846	60,082	6,609.1	21,930	54,954	6,045.1

Idaho Fir Mortality

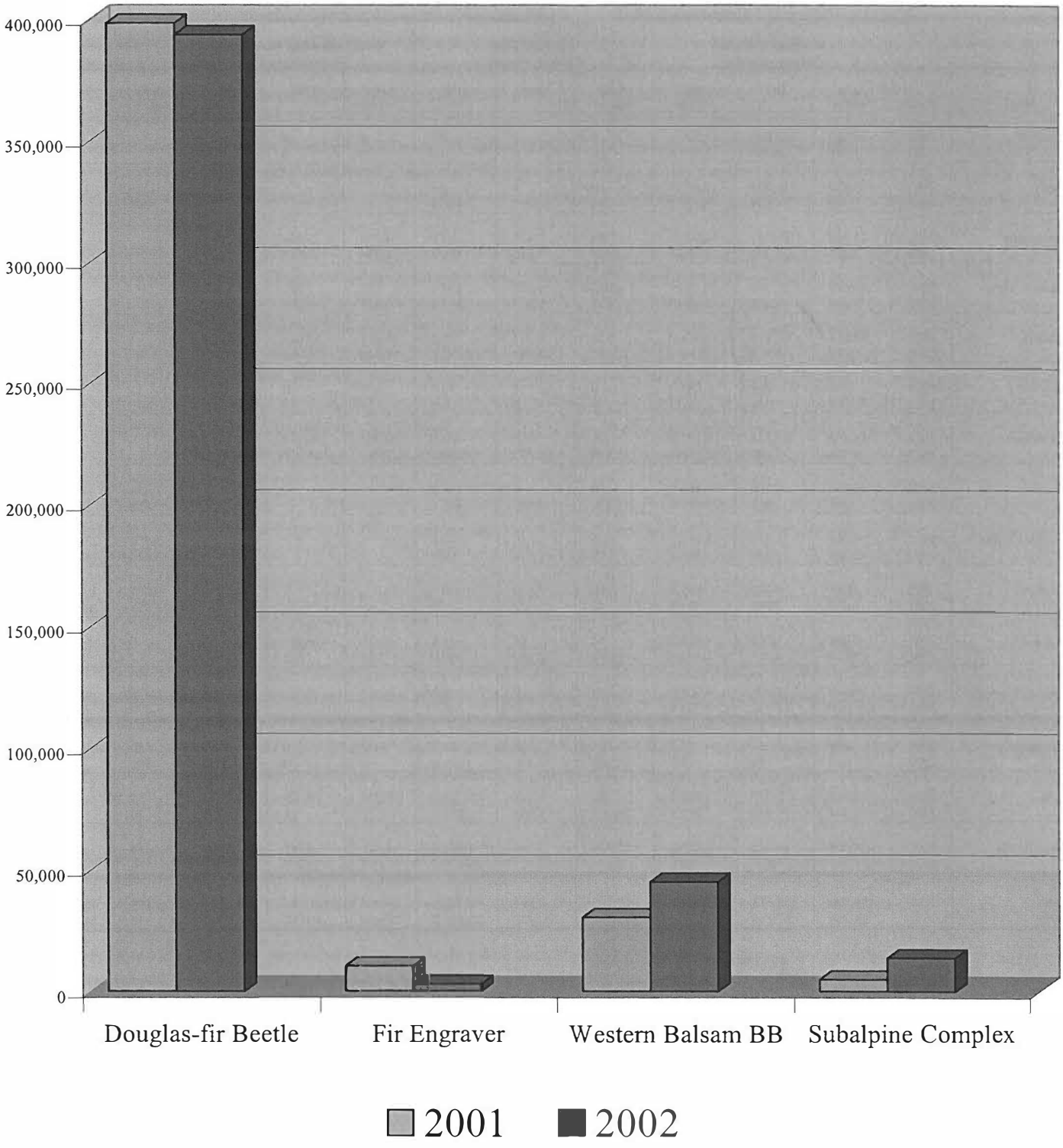


Figure 3. Fir Mortality
By Bark Beetle Species as determined
By Aerial Surveys in Idaho 2001 - 2002

DEFOLIATORS

LARCH CASEBEARER

2001 - There were no areas in northern Idaho where visible defoliation caused by larch casebearer was recorded. As recently as 1999, approximately 14,000 acres showed some level of defoliation. Those infested acres declined to only a few hundred in 2000. In 2001, a minor amount of defoliation was noted from ground observations in northern Idaho, but none was recorded during annual aerial detection surveys. Ground collections conducted from 1997 through 2000 showed still-low parasitism rates in most casebearer populations; at least when compared to similar surveys conducted during the 1970s, the last time casebearer populations were unusually high. Parasitism levels did not seem high enough to totally account for population decline, but other causes were not determined. Two areas were ground-surveyed in 2001, where some defoliation was noticed—near St. Maries and Sandpoint, Idaho. In the latter, parasitism rates had increased. Because populations have decreased to endemic-like levels, ground surveys in northern Idaho have been discontinued. Affected areas will be occasionally monitored for a resurgence of populations; but we anticipate only minor amounts of widely scattered defoliation in 2002.

2002 - There were no areas in northern Idaho where visible defoliation caused by larch casebearer was recorded by aerial or ground surveys. The population that caused defoliation from 1997-2001 has declined to very low, undetectable levels. Rates of parasitism were monitored each year of the outbreak, but levels did not seem high enough to totally account for the population decline. Other causes were not determined. Affected areas will be occasionally monitored for a resurgence of populations; but we do not anticipate defoliation in 2003.

WESTERN SPRUCE BUDWORM

2001 - In Idaho, 3,800-acres of defoliation ranging from light to heavy was observed on the Boise and Targhee National Forests.

2002 - On the Kaniksu of the Idaho Panhandle National Forests, 6,904 acres were reported as defoliated by the western spruce budworm (*Choristoneura occidentalis* Freeman) in hemlock stands. There was a significant increase in number of moths caught in pheromone traps at several trapping sites and a slight increase in moths caught at several other trapping sites. There was little to no budworm activity between 1992 and 2001. We are also beginning to record moderate to high levels of defoliation from ground surveys in localized areas. If weather conditions remain within the normal range or are warmer and drier during 2003, we can expect budworm populations to increase in Idaho. We also expect to begin to see scattered defoliation on forests west of the divide and on the Nez Perce and Kaniksu National Forests in Idaho. Similar to 2001, most of the defoliation for 2002 was concentrated on the Targhee and Boise National Forests in southern Idaho (11,700 and 3,475 acres, respectively).

HEMLOCK LOOPER

2001 – 28,408 acres of defoliation on the Coeur d'Alene, Clearwater and St. Joe NF reporting areas on Grand fir and Douglas-fir.

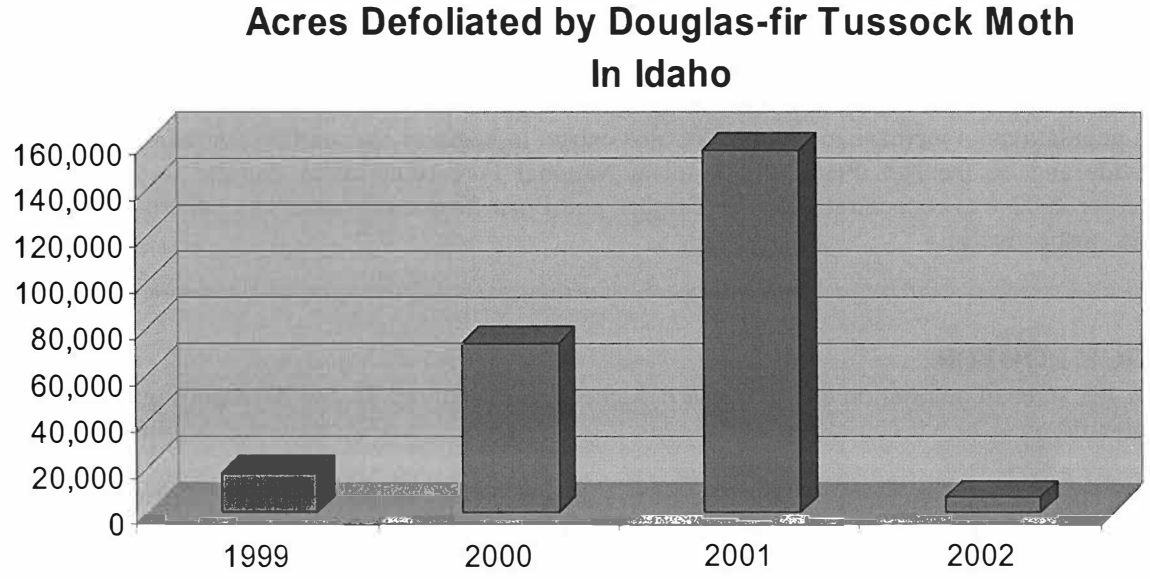
2002 - Detected on approximately 53,400* acres in northern Idaho. In 2002 the most heavily impacted areas were the Clearwater and Nez Perce National Forests, Idaho. Defoliation ranged from light to heavy with understory trees most heavily impacted. Historically, hemlock looper outbreaks were reported in the Northern Region from 1937-39 and 1972-73.

*Some aerial surveys in Idaho were flown before defoliation was visible, this figure is an approximation.

DOUGLAS-FIR TUSSOCK MOTH

2001 – In northern Idaho aerial survey results report 141,873 acres defoliated near the town of Potlatch, Idaho, on the Palouse Ranger District of the Clearwater National Forest and adjacent state, private, and reservation lands. This is more than double the 54,753 acres with defoliation observed in 2000. In the spring of 2001, an aerial spray project was conducted on private and state lands. The Idaho Department of lands coordinated the spray program in which 60,224 acres were treated with Dimilin and 16,268 acres were treated with *Bacillus thuringiensis*. Additional defoliation is anticipated in north Idaho in 2002, and the Idaho Department of Lands is evaluating control options on state and private lands. With trap catches of Douglas-fir tussock moth suggest that populations is still very high and larvae were found at most sites sampled. At approximately 117 trapping sites in northern Idaho, about 41,828 moths were caught in 2001, compared to 29,568 moths in 2000. Of the 117 trapping sites, 108 had over 25 moths per trap. Trap catches, some larval sampling and observations suggest populations should drop off in 2002 but some light defoliation is expected in northern Idaho in 2002. Approximately 17,000 acres of defoliation from Douglas-fir tussock moth were observed in the Owyhee Mountains in southwestern Idaho. Most of this damage occurred on Bureau of Land Management, State of Idaho, and private Douglas-fir forests in the Owyhee Mountains of southwest Idaho. Pheromone baited trap catches indicated increasing populations on the Weiser and Council Ranger Districts of the Payette NF.

2002 - In northern Idaho about 5,400 acres were defoliated on the Palouse Ranger District of the Clearwater National Forest and adjacent state, private, and reservation lands. This is down from about 142,000 acres defoliated in northern Idaho in 2001. In the spring of 2002, the Idaho Department of lands conducted an aerial spray project in which 30,107 acres on private, state and Coeur d'Alene tribal lands were treated with Dimilin. Defoliation did not occur in the sprayed areas. At approximately 122 trapping sites in northern Idaho, about 19,093 moths were caught in 2002, compared to 41,828 moths in 2001. Of the 122 trapping sites, 55 had over 25 moths per trap. Trap catches, some larval sampling and observations suggest populations should drop off in 2003. Egg mass surveys indicate populations are declining rapidly. No defoliation is expected in 2003. In southeastern Idaho, tussock moth defoliation was found on over 1,360 acres of Bureau of Land Management and Private Lands, SE of Pocatello, ID. The outbreak in the Owyhee Mountains of southwestern Idaho appears to be over.



Douglas-Fir Tussock Moth

Table 4. Means of average moth catch per 5 pheromone trap/sample plots in Idaho, **2002-1992**

AREA	Number of 2002 sample plots	2002	2001	2000	1999	1998	1997	1996	1995	1994	1993	1992
STATE AND PRIVATE												
Coeur d'Alene	5	0.0	0.0	0.0	0.6	0.3	0.08	0.0	0.0	0.0	0.0	0.1
Coeur d'Alene	5	0.0	0.0	0.0	0.5	0.08	0.0	0.0	0.0	0.0	0.0	0.1
Plummer-Moscow	13	33.9	73.5	75.2	36.6	20.4	4.1	0.4	0.3	0.02	0.1	0.7
Plummer-Moscow	18	43.9	82.9	63.3	24.0	14.0	1.2	0. 1	0.04	0.0	0.0	0.5
Plummer-Moscow	13	31.4	87.2	55.9	19.0	2.6	0.1	0.0	0.0	0.0	0.0	0.4
Plummer-Moscow	1	1.0	0.2	93.0	36.4	29.8	1.4	0.2	0.2	0.0	0.0	4.0
Plummer-Moscow	2	37.9	79.1	89.4	44.1	54.8	2.7	0.2	0.1	0.0	0.0	0.2
Plummer-Moscow	3	62.1	80.1	96.1	55.6	29.7	2.2	0.3	0. 1	0.0	0.0	1.6
Plummer-Moscow	15	30.8	72.7	82.4	69.7	30.1	7.8	1.4	0.04	0.0	0.0	0.1
Plummer-Moscow	1	8.8	75.4	*	37.6	20.2	0.4	0.0	0.0			
Plummer-Moscow	3	47.7	38.9	97.1	67.1	52.1	3.1					
Plummer-Moscow	2	15.5	39.1	86.8	53.0							
Plummer-Moscow	27	27.4	68.7									
Plummer-Moscow	24	22.1	66.3									
Craig Mountain	7	0.1	6.4	0.0	0.6	0.5	0.0	0.0	0.0	0.0	0.05	0.5
NEZ PERCE NF												
Moose Ck RD	4	0.8	2.0	1.0	2.4	1.7	0.0	0.0	0.0	0.0	0.04	0.1
Salmon River RD	5	0.1	2.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.08	0.7
CLEARWATER NF												
Lochsa RD	2	0.4	5.9	*	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.2
North Fork RD	3	0.3	15.1	0.8	1.9	2.6	0.0	0.0	0.0	0.0	0.0	0.1
Pierce RD	6	3.6	16.9	1.0	0.4	0.3	0.0	0.0	0.0	0.0	0.0	0.3
Palouse RD	6	32.9										
BOISE NF												
Mountain Home RD	6	5.9	17.4	15.4	3.8	0.1	0.5	2.1	0.0	0.1	0.0	32.2
Idaho City RD	8	1.0	3.4	0.8	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.6
Cascade RD	5	0.0	0.4	0.2	0.2	0.04	0.0	0.0	0.0	0.0	0.0	0.4
Lowman RD	9	0.1	0.7	0.4	0.0	0.1	0.0	0.0	0.0	0.0	0.0	1.8
Emmett RD	10	0.5	5.1	6.9	6.8	3.0	0.3	0.02	0.0	0.0	0.02	1.2
PAYETTE NF												
Council RD	11	1.2	6.4	15.8	13.1	5.8	1.4	0.05	0.1	0.0	0.0	2.8
Weiser RD	12	3.3	11.9	19.0	29.9	26.9	3.6	0.6	0.1	0.1	0.0	2.4
New Meadows RD	11	0.2	5.5	9.8	9.3	5.3	0.6	0.02	0.0	0.0	0.0	1.6
McCall RD	5	0.1	2.0	2.7	1.7	0.6	0.0	0.0	0.0	0.0	0.0	0.8
SAWTOOTH NF												
Burley RD	2	3.6	20.2									
Fairfield RD	5	1.1	9.3	9.0	1.7	0.5	0.08	0.1	0.0	0.3	0.0	35.3
OTHER												
Owyhee Mountains	3	6.1	57.5	84.6	40.2	32.1	30.6	24.0	13.1	2.0	0.0	51.1
Sharps Canyon	1	50.2	38.2	29.6	12.8	*	0.4	0.0	0.0	0.0	0.0	18.8

Douglas-Fir Tussock Moth Pheromone Trap Catches

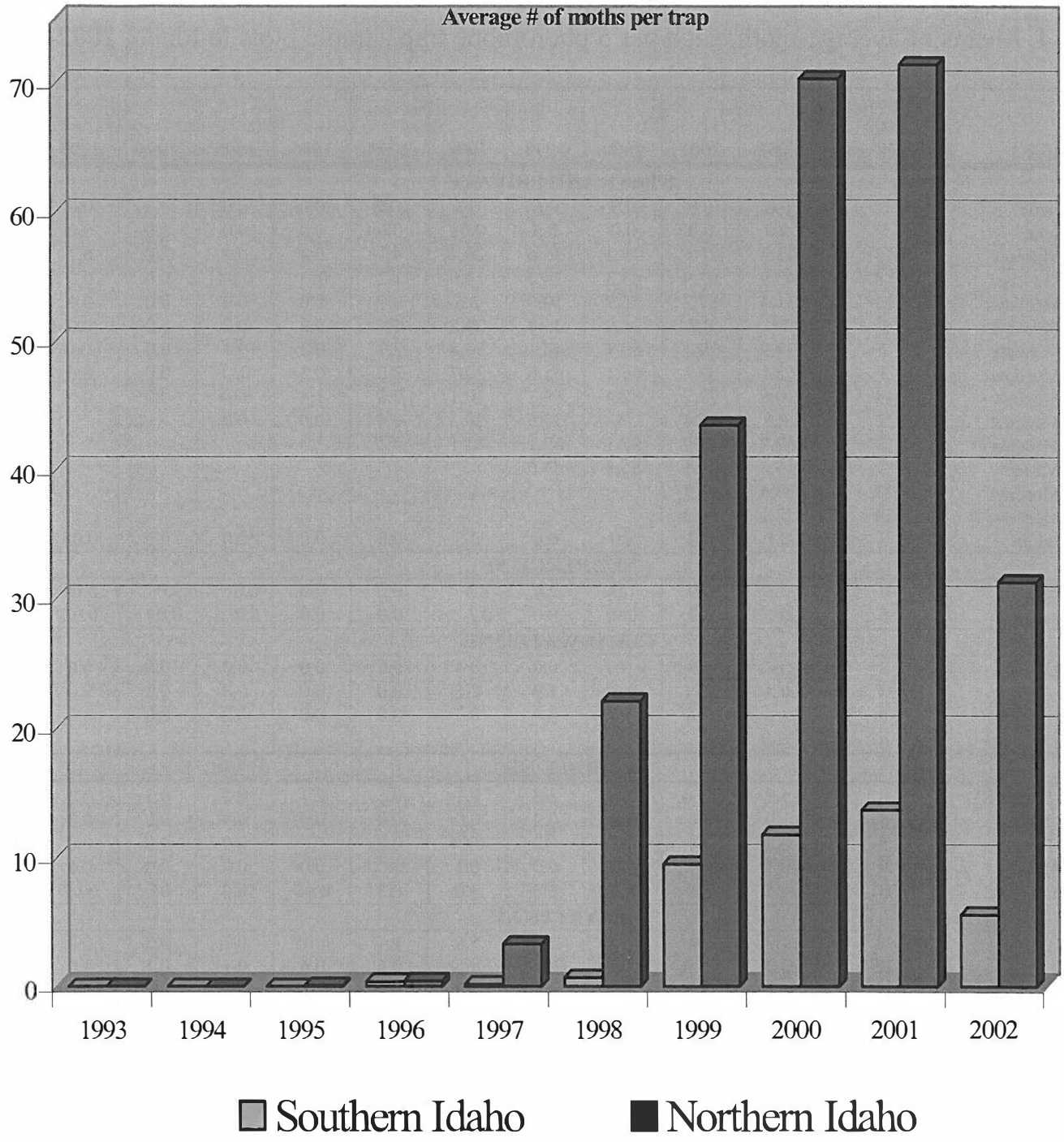


Figure 4 USFS and IDL
Douglas-fir Tussock Moth Trap Catches
in Idaho 1993 - 2002

GYPSY MOTH

The Idaho gypsy moth detection survey program systematically samples all populated areas of the State in order to detect introductions of gypsy moths. Many USDA Forest Service campgrounds are sampled, as well as rest stops, tourist attraction sites and other locations where people congregate. High risk areas, those cities with the highest populations and the highest potential for newly arriving families, are trapped each year. Other areas are trapped every other year or every third year. The survey will continue to expand as cities grow and more people move into the rural areas of our state. All trapping results are incorporated into the National Agricultural Pest Information System (NAPIS) database.

DETECTION TRAPPING

In 2001 the cooperating agencies in the Idaho gypsy moth detection program placed 5,346 detection traps throughout the state. Another 5,024 detection traps were deployed statewide in 2002. Pheromone-baited traps were placed on a grid basis at a density of four traps per square mile. Traps were placed throughout the state in cities and towns and the surrounding urban areas and rural communities in accordance with a predetermined rotation schedule. Cities and communities where 20 or more move-ins occur are trapped irrespective of their place in the schedule. A move-in is defined as an individual or family moving to Idaho from a state that is generally infested with gypsy moths. This information is derived from vehicle registration information supplied by the Idaho Department of Transportation. Most infestations are initiated when an egg mass or other life stage of the gypsy moth arrives on an outdoor household article brought by someone moving into the area. Between May 2000 and April 2001, 4,765 "move-ins" occurred, representing a 6.4% decrease from the previous year. Between May 2001 and April 2002, there were 5,188 "move-ins" to the state, representing an 8.2% increase over the previous year. Campgrounds, tourist attractions, and other high-risk locations were also trapped.

DELIMITATION TRAPPING

Delimitation traps were placed at 0 locations in 2001. In 2002, delimitation traps were placed at 2 locations. At Blanchard, north of Spirit Lake in Bonner County, 19 delimitation traps were placed surrounding the capture site of a single male moth in 2001. At Thornton, between Rexburg in Madison County, 16 delimitation traps were placed surrounding the capture site of a single male moth in 2001. Delimitation traps at both locations were placed at a density of 16 traps/mi^2.

MASS TRAPPING

In 2001 & 2002 no mass trapping was done in Idaho.

No gypsy moths were caught in Idaho in 2002.

STATE ADVISORY COMMITTEE

An advisory committee, composed of representatives from the Idaho Department of Lands, The Idaho Department of Agriculture, The U. S. Forest Service Regions 1 and 4, and APHIS, reviews activities and provides guidelines for the gypsy moth program in Idaho.

Gypsy Moth Captures
2001
(No Gypsy Moths Captured in 2002)

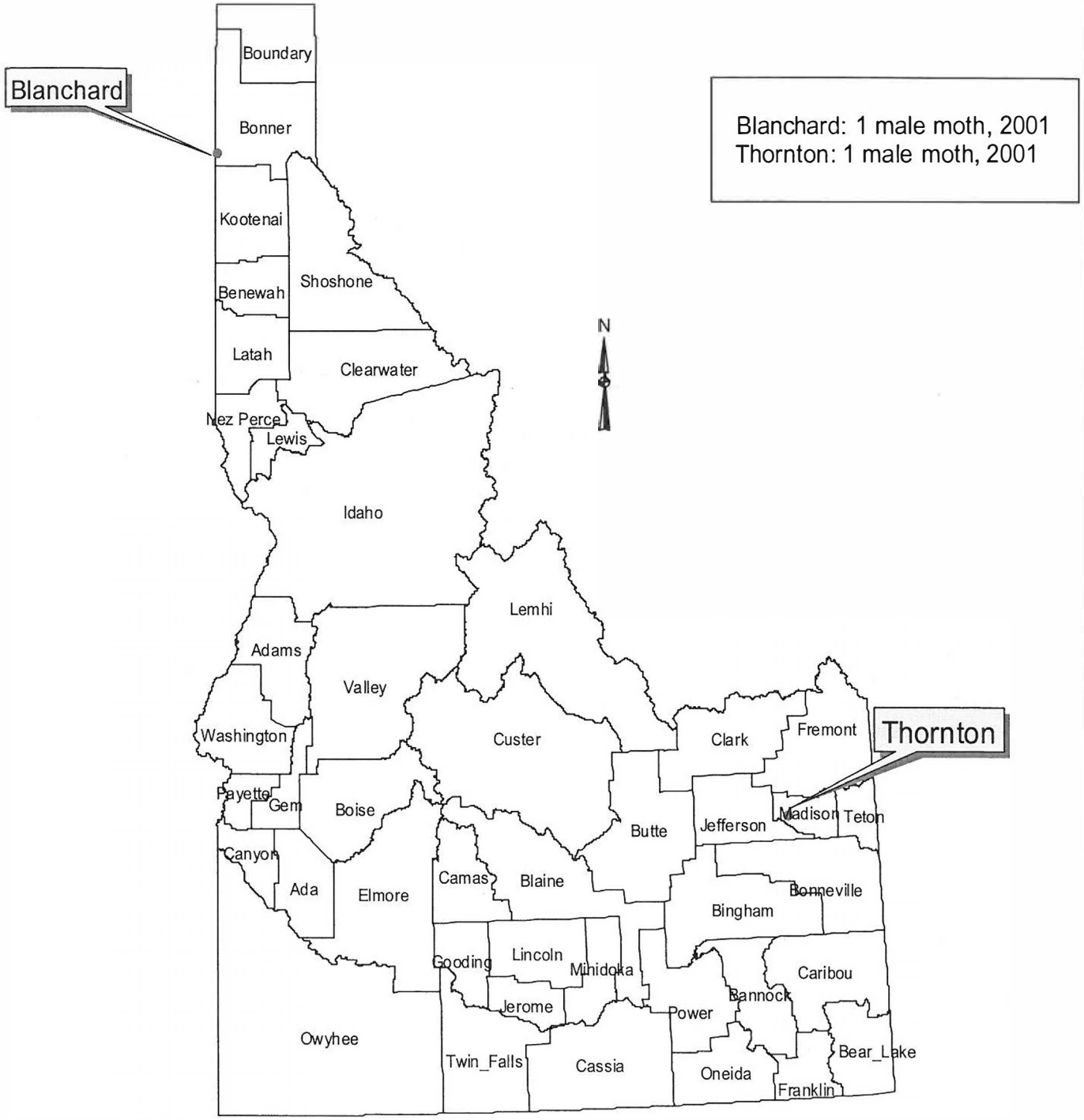


Figure 5. State of Idaho
2001-2002 Gypsy Moth Catch Sites

OTHER INSECTS

Balsam Woolly Adelgid

2001 - Aerial survey data estimate 51,551 acres infested by the balsam woolly adelgid in northern Idaho in 2001. This number is a decrease in infested acres of about 5,000 acres from 2000 (56,426 acres infested reported in 2000). Actual infested acres are probably higher since some areas may not yet be displaying crown symptoms. Areas with the heaviest infestations occur on the St Joe National Forest, Clearwater National Forest, and Nez Perce National Forest and adjacent state, private, and BLM land. Subalpine fir of all ages and size classes are killed. Extensive gouting and bole infestations occur on grand fir, but to date no grand fir over 5 inches in diameter has been documented as being killed by the adelgid. Regeneration mortality of both subalpine and grand fir is high, resulting in forest type conversions in some areas. Continued surveys to delimit the distribution of the balsam wooly adelgid and damage assessment surveys are planned in the near future. First detected in Idaho in 1983 near Couer d'Alene, this near-microscopic insect is capable of killing fir trees in ornamental, forest, or Christmas-tree plantation settings. The host range includes native grand fir and subalpine firs along with white firs planted in landscape settings. Since establishment, the insect's traditional host range in Idaho had been restricted to a roughly 250-mile band in northern Idaho between the Salmon and St. Joe Rivers. However, in 2001 the sap-sucking insect was found killing four subalpine firs in residential settings in Cascade and McCall, Idaho.

2002 - Aerial survey data estimate 85,400 acres infested by the balsam woolly adelgid in northern Idaho in 2002. This number is an increase in infested acres of about 30,000 acres from 2000 and 2001 (56,400 acres infested reported in 2000; 51,500 reported in 2001). Actual infested acres are probably higher since some areas may not yet be displaying crown symptoms. Areas with the heaviest infestations occur on the St Joe National Forest, Clearwater National Forest, and Nez Perce National Forest and adjacent state, private, and BLM land. Subalpine fir of all ages and size classes are killed. Extensive gouting and bole infestations occur on grand fir, but to date no grand fir over 5 inches in diameter has been documented as being killed by the adelgid. Regeneration mortality of both subalpine and grand fir is high, resulting in forest type conversions in some areas. Continued surveys to delimit the distribution of the balsam wooly adelgid and damage assessment surveys are planned in the near future.

CONE AND SEED INSECTS

Western conifer seed bug, Coneworm, Cone beetle

2001 – Cone and seed insects can cause considerable damage to the seeds of western conifers, significantly reducing seed crops. Though insects are found feeding on a variety of tree species in wild stands, they are especially of concern in blister rust-resistant western white pine seed orchards. Seed collected in these orchards is used to regenerate areas where white pine, once the dominant tree species, has nearly disappeared due to white pine blister rust. The insects that cause the most damage in western white pine are western conifer seed bug, *Leptoglossus occidentalis*, cone beetle, *Conophthorus ponderosae*, and coneworm, *Dioryctria abietivorella*. One or more of these insects are often so abundant in northern Idaho white pine seed orchards to warrant an insecticidal spray treatment to protect cones. These insects have also been found destroying whitebark pine seed in high elevation stands. Whitebark pine is an important tree species for watersheds, wildlife, recreation, and aesthetics. This tree species has significantly declined in recent years due to blister rust, periodic outbreaks of mountain pine beetle, natural forest succession and fire suppression. Its seed is extremely valuable for wildlife and regeneration and may need to be protected from insect predation in the future. Studies are underway in cooperation with Forest Insect and Disease research to develop cone beetle behavior chemicals for monitoring and control tools for integrated pest management programs. During 2001 there was the increase in coneworm damage at the tree improvement orchards at Grouse Creek, Idaho. Based on a continuing evaluation of the current damage levels and the projected crop for 2002, chemical treatments are being considered.

2002 – Cone and seed insects can cause considerable damage to the seeds of western conifers, significantly reducing seed crops. Though insects are found feeding on a variety of tree species in wild stands, they are especially of concern in blister rust-resistant western white pine seed orchards. The insects that cause the most damage in western white pine are western conifer seed bug, *Leptoglossus occidentalis*, cone beetle, *Conophthorus ponderosae*, and coneworm, *Dioryctria abietivorella*. One or more of these insects are often abundant enough in northern Idaho white pine seed orchards to warrant an insecticidal spray treatment to protect cones. Cone beetles killed 40% of the western white pine cone crop at Grouse Creek Tree Improvement Area in northern Idaho in 2002. Treatments are planned for 2003 using the behavior chemical 4aa (microencapsulated 4-allylanisol) in cooperation with Forest Insect and Disease research.

FOREST DISEASES

STEM AND BRANCH DISEASES

Comandra blister rust
This disease occurs infrequently on lodgepole and ponderosa pine throughout Idaho. Localized areas of heavy infection resulting in branch, top and entire tree mortality of sapling-size ponderosa pine occurs in offsite plantations in southern Idaho.

Dutch elm disease
In Idaho this disease is common in many communities along the Snake River in southern Idaho, and is slowly working its way into northern Idaho communities. It was discovered in Moscow in 1990, but an aggressive treatment program has limited losses to only a few trees per year for the past several years. It has also been discovered in several communities nearby--Genesee, in Idaho; Palouse and Pullman, in Washington.

Pinyon blister rust
This disease occurs on pinyon pine in the Raft River Mountains on the Sawtooth NF in central Idaho. Disease levels are generally sporadic and tree mortality is low.

Stalactiform rust
This rust disease occurs on lodgepole pine in localized areas throughout Idaho. Severe infection has occurred in localized areas on the Boise, Payette, Sawtooth and Targhee NF's.

Western gall rust
This disease occurs throughout the range of lodgepole and ponderosa pine in Idaho. Disease levels vary from year to year and some sites are more prone to damage from this disease than others. Genetic resistance varies widely and resistant individuals can often be found in locations with high infection levels. Generally the disease is not an important cause of mortality, although branch and stem breakage can be of concern, especially within recreation areas. Gall rust is an important consideration in tree improvement plantations where infection can significantly affect performance of young trees. It has also been found damaging ornamental pines including Scots, Austrian and mugho.

White pine blister rust
White pine blister rust was introduced into western North America about 1910, and subsequently spread to western white pine, whitebark pine and limber pine in Idaho and other western forests. This disease along with bark beetles, fire suppression, and logging resulted in reducing white pine dominated stands to less than 5% of the 5 million acres where it once was the dominant species. This disease continues to kill seedlings that naturally regenerate from remaining white pine trees, and, in collaboration with mountain pine beetle, continues to kill residual mature trees. This has resulted in major changes in historical transitions in forest types over broad areas. In moist habitat types, where white pine was historically the dominant species, it has been replaced by species such as grand fir, Douglas-fir, and hemlock which are more susceptible to native disturbances such as bark beetles and root diseases. Efforts to restore white pine are concentrating on planting stock with improved resistance. We are currently intensifying monitoring efforts to gain a better understanding of how well the improved stock is performing over time. In addition, pruning lower branches from young trees is being conducted on a large scale because it can greatly improve survival in some areas.

Blister rust is also causing extensive mortality in high-elevation five-needle pines. Recent surveys in northern Idaho and western Montana high-elevation forests have found infection rates in whitebark pine regeneration of up to 90%. There is a growing concern that severe losses of large diameter whitebark pine due to bark beetles coupled with regeneration losses due to blister rust may have significant impacts on water and wildlife in these fragile ecosystems.

CANKER DISEASES

Atropellis canker

This disease occurs on lodgepole pine and is usually found in groups of pole-sized trees. This disease primarily causes stem defects and topkill; tree mortality is infrequent. The disease is most common in southern Idaho, but can be found sporadically across the entire state.

Cytospora canker

This disease has been found throughout the state on all *Abies* spp. Infected trees display branch flagging, top killing, and infrequent mortality. The disease is associated with environmental stresses such as drought, frost, and freezing damage. Severely-infected subalpine fir may be killed by the western balsam bark beetle.

Sphaeropsis blight

This disease is very common on ponderosa pine in many areas throughout Idaho. Damage occurs primarily as a branch or main stem dieback with dead branch tips especially common on exposed portions of tree crowns. Affected trees are often found in riparian areas, although damage can occur on the edges of any ponderosa pine stand. Apparently, disease severity is cyclic and associated with years of prolonged cool, wet weather. This disease does not normally cause tree mortality (except in nursery seedlings) but results in trees with dieback symptoms that may be especially unsightly in recreational and residential areas.

STEM DECAYS

Aspen trunk rot

Decay caused by this fungus occurs most frequently in aspen stands in southern Idaho; damage seems to increase in stands older than 80 years old.

Rust Red stringy rot (Indian Paint fungus)

This fungus is an important cause of heartwood decay of hemlock and *Abies* spp. It causes more than 90% of the decay occurring in these species and is especially damaging in trees older than 60 years. The most extensive damage is usually found in stands with multiple entries. In northern Idaho stands with prolonged periods of cool, wet conditions, usually have the most damage but in southern Idaho decay caused by this fungus is also common in mature and overmature stands of *Abies* spp. in much drier climates.

Red ring rot (White pocket rot)

This fungus causes white pocket decay of heartwood in western larch and all pine species. It occurs less frequently on spruce, Douglas-fir and *Abies* spp. Damage levels vary considerably throughout Idaho. Mature trees with advanced decay are often used by cavity nesters.

ROOT DISEASES

Douglas-fir and Abies spp. are the primary hosts of root diseases. These species have increased dramatically during the past several decades due to the loss of western white pine, western larch and ponderosa pine from blister rust, fire control, logging and forest practices such as thinning that favor shade tolerant species. As a result, root diseases have become the most important diseases in northern Idaho. The most important root pathogens are Phellinus weirii (cause of laminated root disease) and *Armillaria ostoyae* (cause of Armillaria root disease). Many root pathogens are intimately associated with insects (particularly bark beetles) either as vectors or agents that attack and often kill infected trees. Therefore, mortality levels may vary from year to year in response to bark beetle activity.

Annosum root disease

Annosum root disease is separated into two types based on the hosts attacked. The "p-type" attacks pines and is common in ponderosa pine stands in western Montana. Infected trees are frequently found near stumps, which serve as inoculum sources. Importance, distribution, and impact of this root disease varies widely throughout Idaho. Most damage is concentrated in lower elevations where ponderosa pine is the dominant tree species and past harvesting of large trees has been common. Presence of annosum root disease in ponderosa pine stands greatly decreases the potential for managing ponderosa pine. These sites are usually too dry to effectively grow alternative tree species, so preventing the introduction and subsequent increase of annosum root disease is crucial for managing ponderosa pine. The "s-type" of Annosum root disease is widespread at low levels on Douglas-fir and true firs in mixed conifer stands throughout western Montana and northern Idaho. It is frequently found in association with other root diseases.

Armillaria root disease

This pathogen is the most broadly distributed of the root pathogens and the most important disease agent, overall. It frequently occurs in conjunction with annosum root disease, laminated root rot, or brown cubical root and butt rot. Conifers of all species can be killed by *Armillaria* when they are young, but only Douglas-fir, subalpine fir and grand fir remain highly susceptible throughout their lives. Consequently, the damage is much greater in the latter species where severe disease often turns formerly forested sites into permanent shrub fields.

Black stain root disease

Black stain root disease is found infrequently in Idaho. The pathogen may cause pinyon pine mortality (associated with insect attacks) in southern Idaho and occurs on off-site ponderosa pine in some stands in northern Idaho. The fungus is vectored by root-feeding insects and infected trees are usually attacked and killed by bark beetles.

Brown butt rot

Phaeolus schweinitzii causes brown-cubical decay of roots and butts of Douglas-fir and pine species (particularly ponderosa pine). This fungus is a common root inhabitant of Douglas-fir trees of all ages, but causes root decay mostly in mature trees. Trees on poor sites (shallow soils with poor water-holding capacity) are especially prone to damage by this fungus. Infected trees are rarely directly killed by this fungus, but may be predisposed to windthrow and bark beetle attacks.

Laminated root rot

This root pathogen is a major cause of mortality of Douglas-fir and *Abies* spp. in northern Idaho. Losses in some areas are extensive, although distribution of the pathogen within forests varies widely. Some level of disease-associated mortality occurs each year with greater mortality occurring during years of drought stress or high bark beetle populations.

This disease is most severe on sites that historically may have supported mostly western white pine and western larch. These tree species have been replaced by highly susceptible Douglas-fir, grand fir and subalpine fir with consequent increases in this pathogen. It causes damage to trees of all ages, primarily in distinct groups or pockets. This pathogen is often found in conjunction with armillaria and/or annosum root disease, and like *Armillaria*, often converts formerly forested sites to long term shrub fields.

Tomentosus root rot

This disease occurs on Douglas-fir, subalpine fir, Engelmann spruce and lodgepole pine. The pathogen usually causes root and butt decay, often in association with other root-infecting fungi. Infected pole-sized or larger trees may have increased susceptibility to bark beetle attack and windthrow. The pathogen is most common in southern Idaho, but occurs at low levels throughout the state.

White mottled rot

This root pathogen of aspen is increasing throughout southern Idaho. The disease is frequently found on windthrown trees on the Caribou and Sawtooth NF's.

DWARF MISTLETOES

Dwarf mistletoes are parasitic seed plants in the genus *Arceuthobium.* They occur on most conifer species in Idaho, especially Douglas-fir, western larch, ponderosa and lodgepole pine. Western larch overstory trees throughout many stands in northern Idaho are extensively infected with dwarf mistletoe. Douglas-fir and ponderosa pine are infected only in particular stands in northern Idaho. Lodgepole pine dwarf mistletoe. Suppression projects have continued to remove infected overstory trees. However, dwarf mistletoes remain very widespread and are probably are the most damaging disease in southern Idaho.

Lodgepole pine dwarf mistletoe is especially damaging in southern Idaho, and infests approximately 2 million acres (28 percent) of the lodgepole pine type in Region 1 causing about 18 million cubic feet of growth reduction annually. Douglas-fir dwarf mistletoe infests about .6 million acres (13 percent) of Douglas-fir forests, reducing growth by approximately 13 million cubic feet annually. Western larch dwarf mistletoe occurs on about .8 million acres (38 percent) of western larch stands, and reduces annual growth by over 15 million cubic feet. Ponderosa pine dwarf mistletoe is prevalent throughout its host range in southern Idaho and is locally heavy in ponderosa pine stands around Coeur d'Alene and along the Spokane River drainage in northern Idaho. Limber pine and whitebark pine are heavily infected in localized areas in Montana, with infection being most prevalent east of the Continental Divide.

FOLIAGE DISEASES

All conifer species are susceptible to foliage diseases but damage varies from year to year. Foliage diseases are usually favored by high moisture conditions, so damage is usually most severe in dense stands and in the lower portions of crowns. Infections generally occur during moist periods in the summer or fall, but damage may not be observed until needles are killed the following spring. Since most foliage diseases only attack one age class of needles, the very rarely cause tree mortality, but several years of infection may result in reduced growth. However, they may be important problems in Christmas tree and tree improvement plantations where healthy foliage is required. In these cases, direct suppression with fungicides is often warranted.

Elytroderma needlecast

This foliage disease actually grows into small branches where it can perpetuate the disease year after year. In 1996, high levels of infection were noticed throughout many stands in Idaho. Infection was especially severe on the Salmon National Forest where foliage discoloration was noted on more than 9500 acres. In 1997 and 1998, relatively high levels of infection again occurred throughout the state. Localized areas of heavy infection from Elytroderma were seen in Montana in 1999. Elytroderma has been severe in several areas of western Montana for a number of years, but several new heavily infected areas were reported in 1998 and 1999. This apparent increase in Elytroderma indicates that favorable weather conditions for infection probably occurred during the summers of 1997 and 1998.

Lodgepole pine needlecast

Lophodermella concolor causes cyclic damage on lodgepole pine throughout Idaho. In southern Idaho, the disease appears following periods of drought. In northern Idaho, extensive damage is evident in the early spring in some stands. Damage varies from year to year and it is difficult to predict future disease levels based on observations of spring weather conditions. High levels of infection make trees appear extensively damaged. However, the disease usually has no prolonged effects on infected trees although growth may be temporarily reduced. An exception is in tree improvement plantations where growth reductions seriously affect tree performance.

Rhabdocline needle cast
This disease occurs on young Douglas-fir throughout Idaho; it is particularly noticeable in some stands in northern Idaho and may cause extensive defoliation on young trees. Christmas tree production has been greatly reduced or eliminated in certain parts of northern Idaho because of this disease.

Swiss needle cast
This is another foliage disease of Douglas-fir that occurs throughout northern Idaho. In recent years, infection levels have increased, probably because of increasing fungal inoculum and conducive spring weather. Affected trees may have chlorotic thinning crowns as foliage is slowly killed and needle retention is reduced.

Larch needle diseases
Larch needlecast is caused by *Meria laricis* and needleblight is caused by *Hypodermella laricis*. Both diseases are generally cyclical, occurring at high levels during years of prolonged cool, moist weather in the spring and early summer. In 1996, these diseases were epidemic throughout central Idaho; apparently associated with a late June frost. More than 88,000 acres were damaged on the Payette and northern portions of the Boise National Forests. However, disease incidence in 1997 and 1998 declined, primarily due to increased defoliation by larch casebearer.

Fir broom rust
This disease is widespread on *Abies spp.* throughout Idaho. Although the disease is usually of little consequence, high disease levels occur in some stands south of the Snake River in southern Idaho.

Spruce broom rust
This disease is scattered throughout spruce stands in Idaho. It appears most commonly in spruce stands in eastern Idaho.

Cedar apple rust (Gymnosporangium rusts)
In eastern Idaho, this disease causes a leaf spot on residential apple trees in Challis and Salmon, Idaho and on *Amelanchier* spp. throughout the range of serviceberry in eastern Idaho.

Conifer-aspen rust and conifer-cottonwood rust
In 1996, an epidemic of this rust disease occurred throughout the range of *Populus* spp. in southern Idaho. In 1997, the fungus was not observed on its main conifer host (Douglas-fir); it is possible that the fungus overwintered on its *Populus* hosts due to mild winters. In 1998, disease occurrence was light, probably because of competition with other foliage diseases related to late frosts.

Miscellaneous foliage diseases
Fir needlecast on subalpine and grand fir occurred at low levels from 1996-1998 throughout Idaho. Ponderosa pine needle rust occurred at light to moderate levels. Red band needle blight remained at fairly high intensity on ponderosa pine in some locations, such as along the Lochsa River in northern Idaho. White pine needlecast has declined dramatically during the past few years. Marssonina blight and Shepard's Crook occurred at epidemic proportions on aspen during 1996-1998 in central and eastern Idaho. Affected trees had brown-colored foliage from mid-July until leaf drop in the fall.

NURSERY DISEASES

Fusarium root disease

The most important pathogens affecting both bareroot and container nurseries are caused by species of *Fusarium* which cause damping-off and root diseases of young seedlings. *Fusarium oxysporum* is especially important in bareroot nurseries, whereas *F. proliferatum* is a more important pathogen in container nurseries. Other *Fusarium* spp. which commonly cause nursery diseases include *F. solani, F. sporotrichioides, F. avenaceum, F. acumination, and F. sambucinum.* Although other *Fusarium* spp. may be isolated from diseased seedlings, they are probably either saprophytes or very weak pathogens. Damage levels during 2001 were about normal at most nurseries. *Fusarium* diseases are most commonly controlled by pre-plant soil fumigation in bareroot nurseries and seed and fungicide treatments in container nurseries.

Cylindrocarpon root disease

Cylindrocarpon destructans causes root disease of container-grown five-needle pines (western white pine, whitebark pine) at several container nurseries in Region 1. The pathogen always causes at least low levels of root decay, often without eliciting above-ground disease symptoms on affected seedlings. The disease is best controlled by container sterilization, seed treatments, and periodic fungicide applications.

Gray mold

Botrytis cinerea is an important disease of container-grown western larch, Engelmann spruce, western red cedar, and western white pine seedlings in container nurseries in Region 1. Damage from this pathogen during 2001 was about average; western red cedar had higher than normal damage at one nursery. This disease is best prevented by careful monitoring and sanitation procedures. When the disease is discovered, fungicide applications, alternating several different chemicals, are implemented. *Botrytis* can also cause important damage to cold-stored seedlings after lifting and prior to outplanting. Storing seedlings at below-freezing temperatures and rapidly thawing them prior to outplanting restricts pathogen development.

Pythium root disease

Root diseases caused by *Pythium* spp. occur in poorly drained portions of bareroot seedling beds. Affected beds were treated with fungicide drenches, which reduced disease severity.

Tip dieback

Tip dieback caused by *Sirococcus conigenus* occurred at low levels on 2-0 ponderosa pine seedlings at the USDA Forest Service Nursery in Coeur d'Alene, Idaho. Fungicide applications are usually effective in limiting disease buildup during the spring.

Damping-off

Damping-off is common in both bareroot and container nurseries in Region 1. Disease levels vary widely among different seedlots because much of the inoculum is seedborne. Damage is most often controlled by pre-sowing seed treatments (especially prolonged running water rinses and treatments with aqueous solutions of sodium hypochlorite) and application of post-sowing fungicides during periods of high germinant susceptibility and conducive temperature and moisture conditions.

NURSERY DISEASE PROJECTS

Efforts have been underway the past several years to develop alternatives to pre-plant soil fumigation with methyl bromide/chloropicrin. Several tests were installed at two Idaho bareroot nurseries to evaluate alternative soil treatments and determine their effects on production of bareroot conifer seedlings. In general, one Idaho nursery adopted an alternative chemical fumigant (dazomet) that is as effective as methyl bromide. However, the other nursery has yet to effectively replace methyl bromide fumigation. Bare fallowing fields with periodic cultivation for at least one year prior to sowing a seedling crop is effective in some fields, but not in others. By fallowing, pathogen populations naturally decrease because of lack of adequate food sources for saprophytic activity. In some cases, amending fallowed fields with antagonistic biological control fungi (primarily *Trichoderma harzianum*) has improved disease control. Solarization (covering soil with a plastic tarp during the summer preceding sowing) shows promise at one Idaho nursery. Organic amendments (sawdust, composted mushroom waste, cover crop incorporation) generally are not effective because the added organic matter is used by soil pathogens to increase their populations. Higher pathogen populations directly result in greater levels of seedling diseases. Efforts to develop alternatives to pre-plant soil fumigation at bareroot nurseries will continue. Efficacious alternatives will have to be specific for each nursery. The goal is to be able to produce high quality forest tree seedlings without soil fumigation.

Since *Fusarium* spp. are generally the most important nursery pathogens in Idaho, work has continued to evaluate epidemiological characteristics of these important pathogens. As part of this work, tests were conducted to evaluate pathogenic potential of several different *Fusarium* species on conifer seedlings under controlled conditions. Tested species included *F. oxysporum, F. sporotrichioides, F. solani* and *F. acuminatum.* In general, all of these species contain both pathogenic and non-pathogenic isolates. A larger proportion of the *F. oxysporum* population is comprised of pathogenic isolates than was found for the other species. However, pathogenic strains of all species were isolated from both diseased and non-diseased conifer seedlings. Genetic characterization of *Fusarium* populations within selected nurseries would yield important information that could be used directly to reduce impact of these important pathogens.

STATUS OF CHRONIC DISEASE PROBLEMS		
DISEASE	**HOST**	**LOCATION/REMARKS**
STEM & BRANCH DISEASES		
Aspen trunk rot	Aspen	Decay occurs in most aspen stands in southern Idaho and is increasingly common as stands age exceeds 80 years.
Atropellis canker	Lodgepole pine	Found in pockets in pole sized stands causing defect, topkill, and some mortality.
Comandra blister rust	Lodgepole pine/ponderosa pine	Infection occurs infrequently throughout Idaho. Heavy, localized areas of infection resulting in branch, top, and entire tree mortality of sapling-size ponderosa pines occurs in offsite plantations on southern Idaho.
Cytospora canker	True firs	Branch flagging, top killing, and mortality attributed to this fungus occurs wherever host are found. This disease is associated with environmental stress damage, drought, frost, and freezing. Western balsam bark beetles frequently kill the diseased trees.
Sphaeropsis blight	Ponderosa pine	Is causing widespread branch dieback in many Idaho areas; especially common in riparian areas.
Dwarf mistletoes	Douglas-fir, western larch, lodgepole and ponderosa pine	Suppression projects continue to remove infected overstory trees; however this forest disease remains the most widespread and damaging throughout the state.
Indian paint fungus	True firs, hemlock	Causes 90 percent of decay in these species throughout the state; especially common as age increases beyond 60 years. Common in mature and overmature stands of true firs throughout southern Idaho

Pinyon blister rust	Pinyon pine	This disease occurs in the Raft River Mountains on the Sawtooth National Forest
Red ring rot	Western larch, true firs, Douglas-fir, pines, spruce	Can cause serious decay problems in mature conifers. Infection intensity varies throughout host stands in southern Idaho.
Stalactiform blister rust	Lodgepole pine	This rust occurs in localized areas throughout the host type. Heavy infection has been in very localized areas of the Boise, Payette, Sawtooth, and Targhee NF's.
Western gall rust	Lodgepole and ponderosa pine	Gall rust occurs throughout the host types. Infection levels vary, with localized heavy infection present in both host species.
White pine blister rust	Western white pine, limber pine, whitebark pine	This introduced disease is common throughout its host ranges in Idaho. A formal survey of five-needled pines was conducted in 1995-1997 in southern Idaho to quantify disease incidence and intensity, and determine site and stand characteristics of infected areas.
ROOT DISEASES		
Annosus root disease	Pines, true firs, Douglas-fir, spruce	Causes mortality, root and butt rot especially in young trees near old stumps; frequently in complexes with other root diseases; may predispose trees to windthrow and/or bark beetles. This root disease fungus can be found on pines throughout southern Idaho and on firs and spruce in northern Idaho.
Armillaria root disease	Douglas-fir, grand fir, other conifers especially when young and improperly planted	In northern Idaho, a widespread killer of all sizes of trees; In southern Idaho usually found as a weak pathogen or saprophyte causing little direct mortality or in complexes with other root diseases.
Black stain root disease	Pines, Douglas-fir	Found infrequently in Idaho; caused pinyon pine mortality in southern Idaho; usually in association with other root diseases.
Laminated root rot	Douglas-fir, true firs, occasionally other conifers	Primary killer in many stands from the Nez Perce NF north; may be found with Armillaria or other root diseases.
Schweinitizii root rot	Douglas-fir, pines	This decay is common in mature and overmature forests throughout the host type, especially those with a frequent fire or logging history. The fungus is often associated with other root pathogens and bark beetle activity.
Tomentosus root disease	Douglas-fir, subalpine fir, Engelmann spruce, lodgepole pine	Usually found as root/butt rot with other root diseases; occasionally causes mortality. It causes root and butt rot of pole sized and larger trees, predisposing them to bark beetle attack and windthrow. Most common in southern Idaho, but present throughout the state.
White mottled rot	Aspen	This pathogen is increasing in incidence throughout southern Idaho. The disease can be found on windthrown aspen on the Caribou and Sawtooth National Forest.
FOLIAGE DISEASES		
Cedar apple rust	Juniper, Apple, Serviceberry	In eastern Idaho, this disease caused a leaf spot on residential apple trees in Challis and Salmon, ID and to *Amelanchier* throughout the range of serviceberry in eastern Idaho.
Conifer-Aspen rust Conifer-Cottonwood rust	Aspen, cottonwood, conifers	In 1996 epidemic throughout the host range of all Populus species. In 1997 the fungus has not been observed recently on main conifer host, Douglas-fir, so it may be overwintering on *Populus* due to mild winters. In 1998 occurrence was light due to late frost competition with other foliage diseases.
Rhabdocline needle casts	Douglas-fir	Very widespread but relatively light levels statewide.
Swiss needlecast	Douglas-fir	Widespread in northern Idaho; generally at very low levels of infection.
Elytroderma needlecast	Ponderosa pine	Systemic and annual infections occur throughout the host type. Infection was especially severe on the Salmon National Forest.

Fir broom rust	True firs	Widespread throughout the state; usually of little consequence, but is "extremely common" in stands south of the Snake River in southern Idaho.
Fir needlecast	Subalpine fir Grand fir	Infection occurred at low levels throughout the host type.
Fir needle rust	Subalpine fir	Scattered infection occurs on seedlings and sapling trees throughout the host type.
Larch needle disease	Larch	Incidence and severity of infection in west central Idaho is cyclical. Following a late frost in June, 1996 over 88,000 acres of damage was found on the Payette and northern Boise National Forest. In 1997 and 1998 these diseases were overshadowed by the larch casebearer.
Lodgepole pine needlecast	Lodgepole pine	Infection intensity is worse following periods of drought. During intervening years, the disease is of minor localized importance.
Marssonina blight Shepard's crook	Aspen	In 1996 -1998 the disease was epidemic in central and eastern Idaho. Affected trees had brown colored foliage from mid-July until leaf drop.
Pine needle rust	Pines	Scattered incidence of light to moderate intensity scattered throughout the host types in southern Idaho.
Spruce broom rust	Engelmann spruce	Scattered through host range; most common in eastern Idaho.
White pine needlecast	Western white pine	Infections declined dramatically in 1999-2000.
NURSERY DISEASES		
Cylindrocarpon	Western white pine whitebark pine	Common in soil or contaminated containers, usually a saprophyte but may be a weak parasite, caused losses at several nurseries.
Diplodia tip blight	Pines	Low levels in areas with a history of problems.
Fusarium root disease	Douglas-fir, larch, spruce, others	The most common and widespread nursery disease; amount of damage varies widely. This disease causes small amounts of mortality primarily of 1-0 conifer seedlings at the Lucky Peak Nursery in Southern Idaho.
Grey mold	most conifers, esp. larch, spruce	Common at low levels in many nurseries. Can be a serious problem during seedlings storage.
Meria needlecast	Larch	Infection levels are very low.
Phoma blight	Pines	Commonly isolated from seedlings and soil samples.
Phytophthora/Pythium root rot		These fungi occur infrequently on seedlings and in soil at Lucky Peak Nursery in southern Idaho. Infection results in patch mortality and culling of 2-0 seedlings.
Sirococcus tip blight	Spruce, Pines	Found at low levels at several nurseries.

COMMON AND SCIENTIFIC NAMES OF INSECTS

Balsam woolly adelgid	*Adelges picea* (Ratzburg)
Black-headed budworm	*Acleris gloverana*
Boxelder leafroller	*Caloptilia negundella* (Chambers)
California five-spined Ips	*Ips paraconfusus* Lanier
Cone feeding adelgid	*Pineus coloradensis* (Gillette)
Cone moth	*Eucosma recissoriana* Heinrich
Cone worms	*Dioryctria* spp.
Cranberry girdler moth	*Chrysoteuchia topiaria* (Zeller)
Douglas-fir beetle	*Dendroctonus pseudotsugae* Hopk.
Douglas-fir tussock moth	*Orgyia pseudotsugata* McDunnough
Fir engraver	*Scolytus ventralis* LeConte
Gypsy moth	*Lymantria dispar* (L.)
Lodgepole terminal weevil	*Pissodes terminalis* Hopping
Lodgepole needleminer	*Coleotechnites milleri* Busck
Mountain pine beetle	*Dendroctonus ponderosae* Hopk.
Pine engraver	*Ips pini* (Say)
Pine needle sheath miner	*Zelleria haimbachi* Busck
Red turpentine beetle	*Dendroctonous valens* Le Conte
Rusty tussock moth	*Orgyia antiqua* (L.)
Spruce beetle	*Dendroctonus rufipennis* (Kirby)
Tip moth	*Rhyacionia zozara* (Kearfott)
Western balsam bark beetle	*Dryocoetes confusus* Swaine
Western conifer seedbug	*Leptoglossus occidentalis* Heidmann
Western pine beetle	*Dendroctonus brevicomis* LeConte
Western pine shootborer	*Eucosma sonomana* Kearfott
Western spruce budworm	*Choristoneura occidentalis* Freeman

COMMON AND SCIENTIFIC NAMES OF DISEASES

Annosus root disease	H*eterobasidion annosum* (Fr.) Bref.
Armillaria root disease	*Armillaria ostoyae* (Romagn.) Herink
Atropellis canker	*Atropellis piniphila* (Weir) L. & H.
Black stain root disease	*Leptographium wagneri* (Kendr.) Wingf.
Brown cubical butt rot	*Phaeolus schweinitzii* (Fr.) Pat.
Comandra blister rust	*Cronartium comandrae* Pk.
Conifer-aspen rust	*Melampsora medusae* Thum.
Conifer-cottonwood rust	*Melampsora occidentalis* Jacks.
Cylindrocarpon root disease	*Cylindrocarpon* spp.
Cytospora canker of firs	*Cytospora abietis* Sacc.
Diplodia tip blight	*Sphaeropsis sapinea* (Fr.) Dyko
Dutch elm disease	*Ophiostoma ulmi* (Buism.) Nannf.
Dwarf mistletoes	*Arceuthobium* spp.
Elytroderma needlecast	*Elytroderma deformans* (Weir) Dark.
Fir broom rust	*Melampsorella caryophyllacearum* Schroet.
Fir needlecast	*Lirula abietis-concoloris* (Mayr:Dearn) Darker
Fir needle rust	*Pucciniastrum epilobii* Otth
Fusarium root disease	*Fusarium* spp.
Grey mold	*Botrytis cinerea* Pers. ex Fr.
Indian paint fungus	*Echinodontium tinctorium* (Ell.& Ev.)Ell.& Ev.
Laminated root rot	*Phellinus weirii* (Murr.) Gilb.
Larch needle blight	*Hypodermella laricis* Tub.
Larch needlecast	*Meria laricis* Vuill.
Lodgepole pine needlecast	*Lophodermella concolor* (Dearn.) Dark.
Marssonina blight	*Marssonina populi* (Lib.) Magn.
Phoma blight	*Phoma* spp.
Pine needle rust	*Coleosporium sp.*
Pythium root disease	*Pythium ultimum* Trow.
Red ring rot	*Phellinus pini* Pilat.
Rhabdocline needle cast	*Rhabdocline pseudotsugae* Syd.
	Rhabdocline weirii Parker & Reid
Schweinitzii root/butt rot	*Phaeolus schweinitzii* (Fr.) Pat.
Shepard's crook	*Venturia macularis* (Fr.) E.Muller & Von Arx

Sirococcus tip blight	*Sirococcus strobilinus* Preuss.
Stalactiform rust	*Cronartium coleosporioides* (Diet. & Holw.) Arth.
Spruce broom rust	*Chrysomyxa arctostaphyli* Diet.
Spruce mottled needlecast	*Rhizosphaeria kalkhoffii* Bud.
Swiss needle cast	*Phaeocryptopus gaeumannii* (Rhode) Pet.
Tomentosus root rot	*Inonotus tomentosus* (Fr.) Gilb.
Western gall rust	*Endocronartium harknessii* (Moore) Hir.
White pine blister rust	*Cronartium ribicola* Fisch.
White pine needlecast	*Lophodermella arcuata* (Darker) Darker

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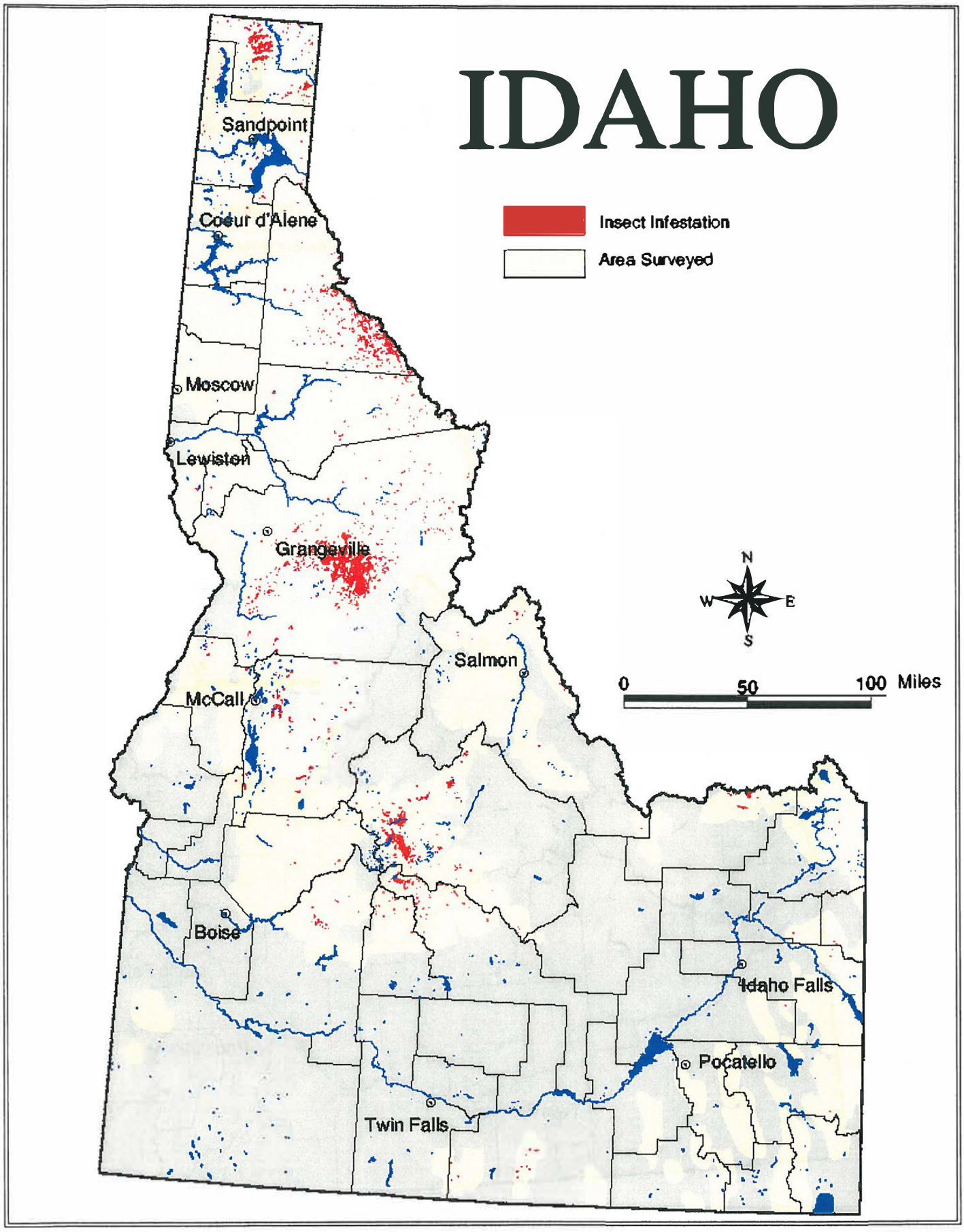
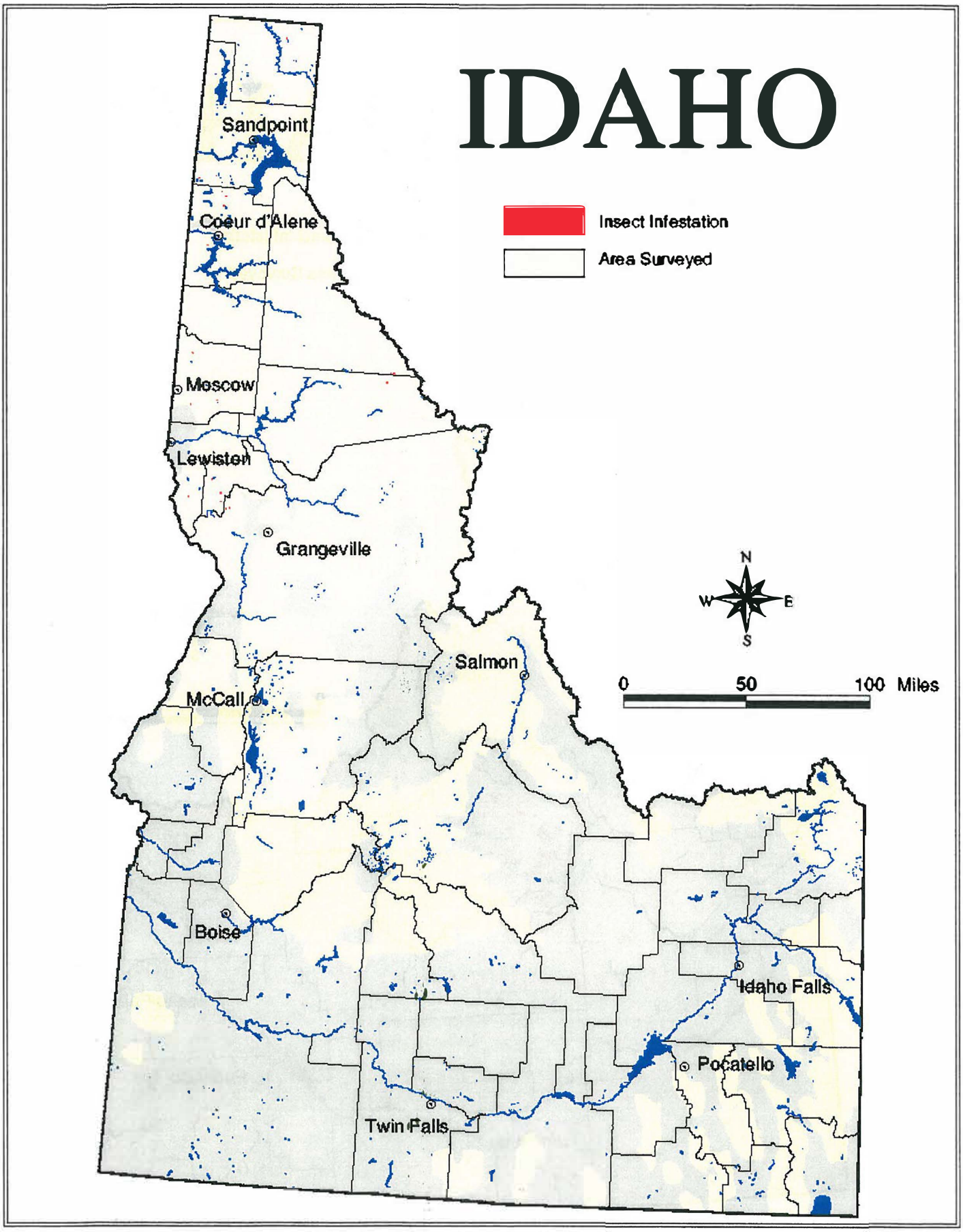
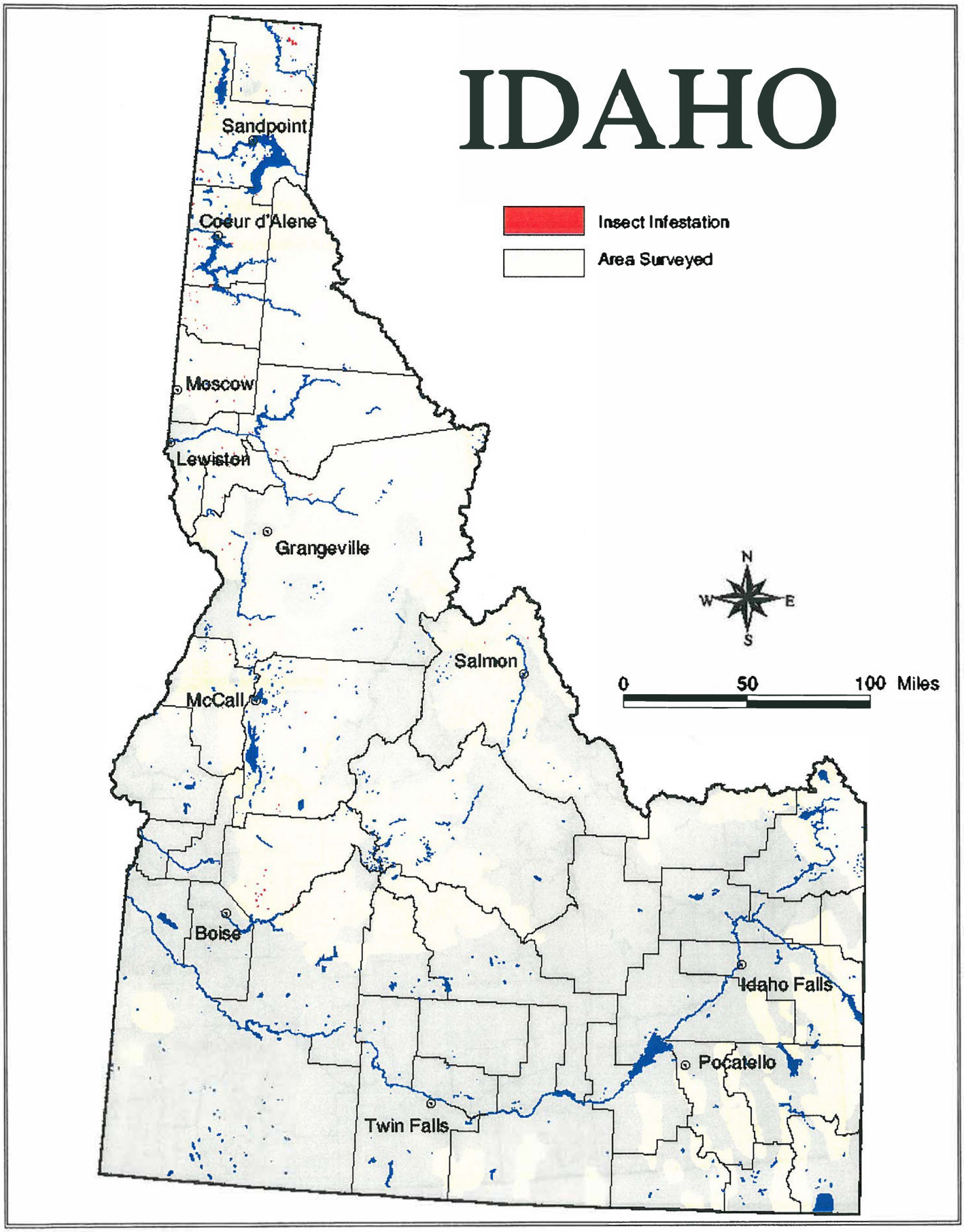


Map 01-1 Areas of Mountain pine beetle infestations in Idaho in 2001

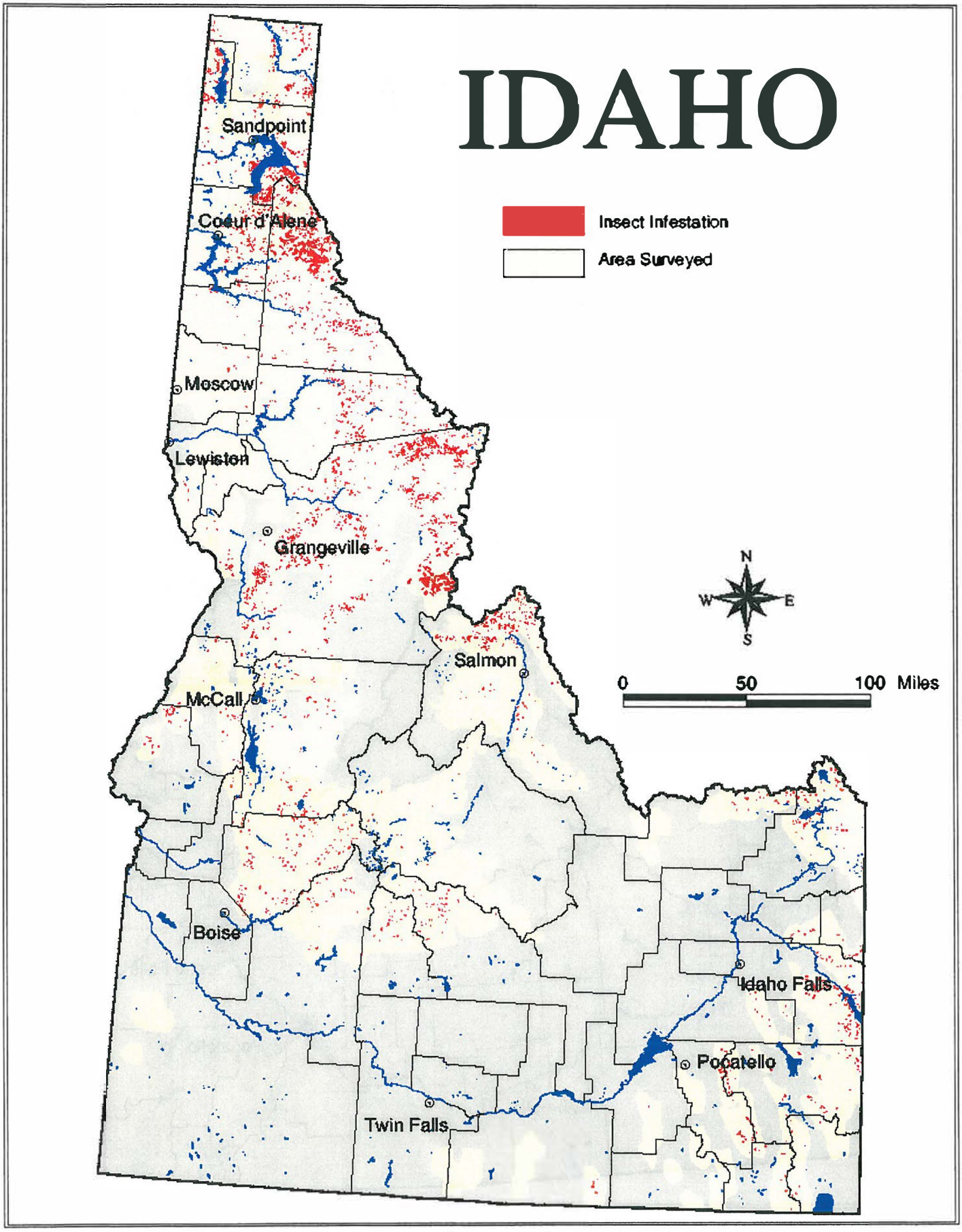


Map 01-2 Areas of Pine engraver beetle infestations in Idaho in 2001

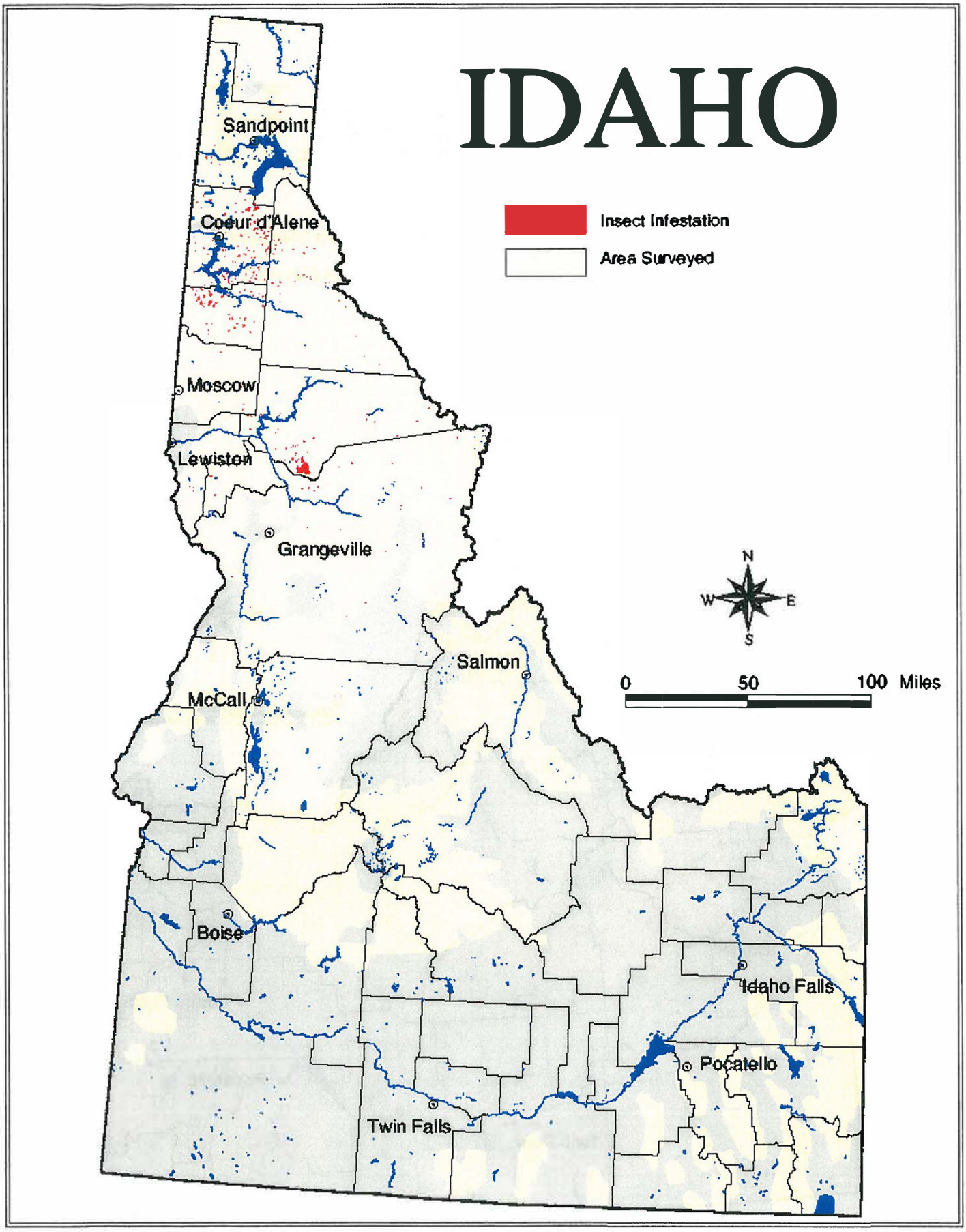


Map 01-3 Areas of Western pine beetle infestations in Idaho in 2001

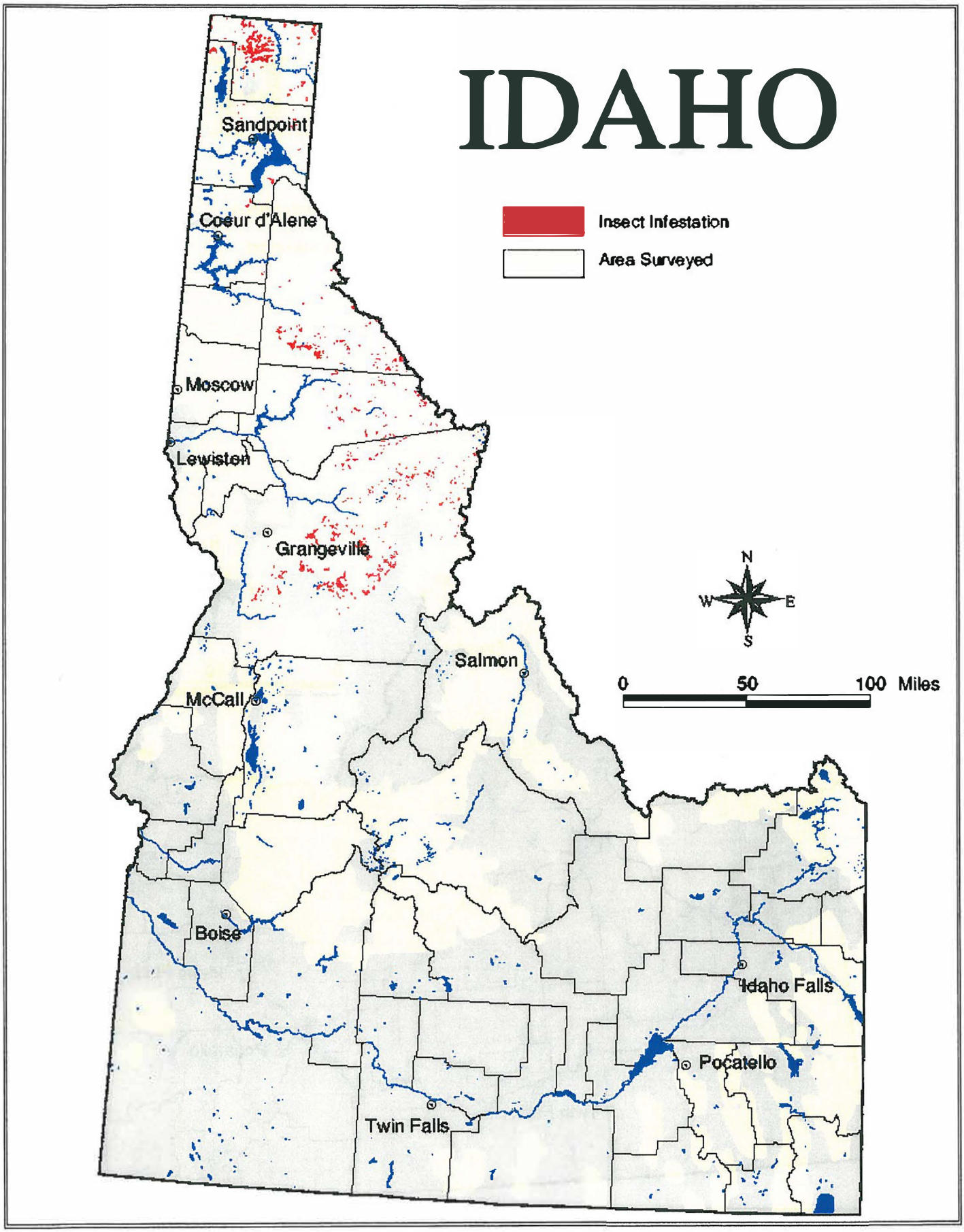
Map 01-4 Areas of Spruce beetle infestations in Idaho in 2001



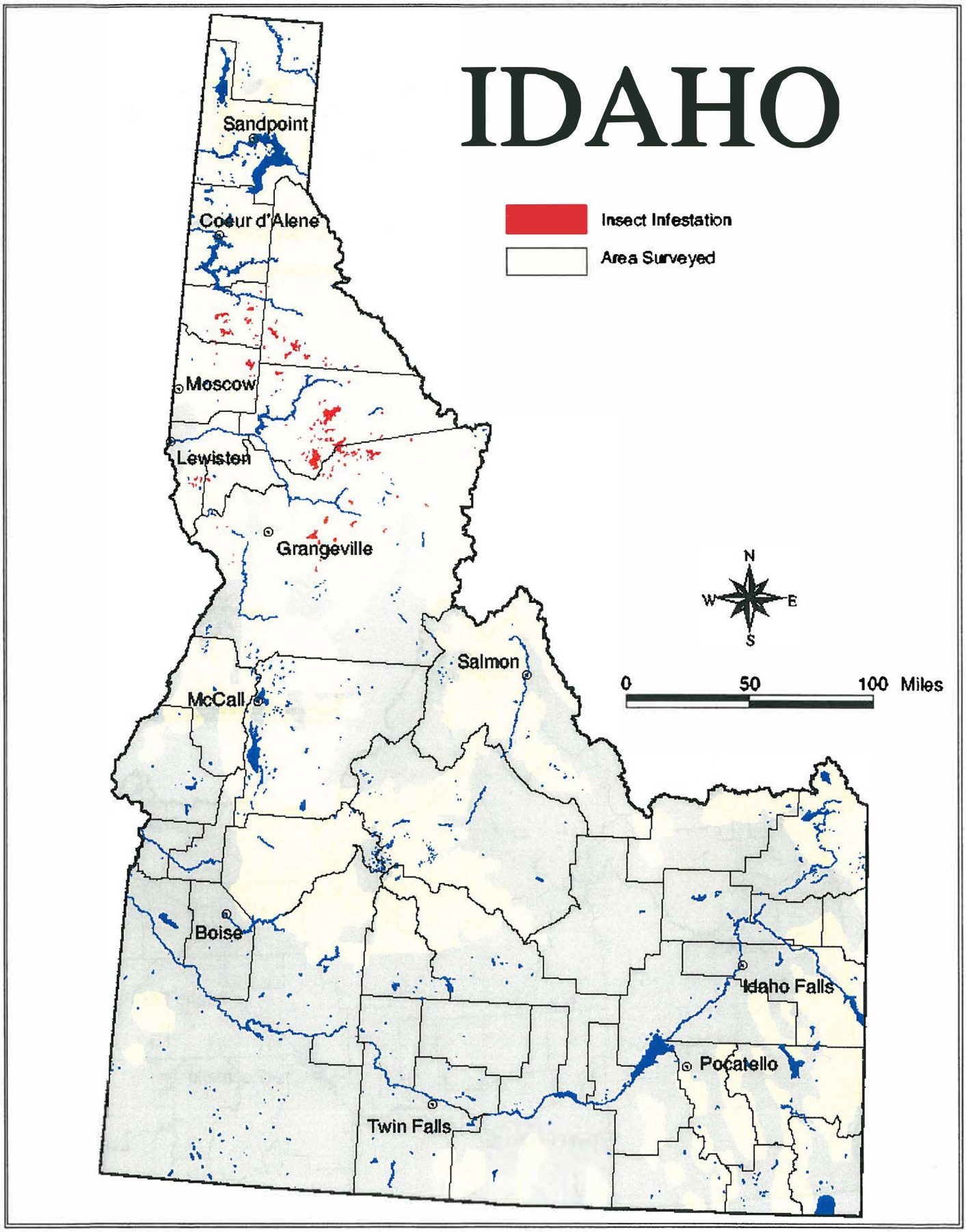
Map 01-5 Areas of Douglas-fir beetle infestations in Idaho in 2001



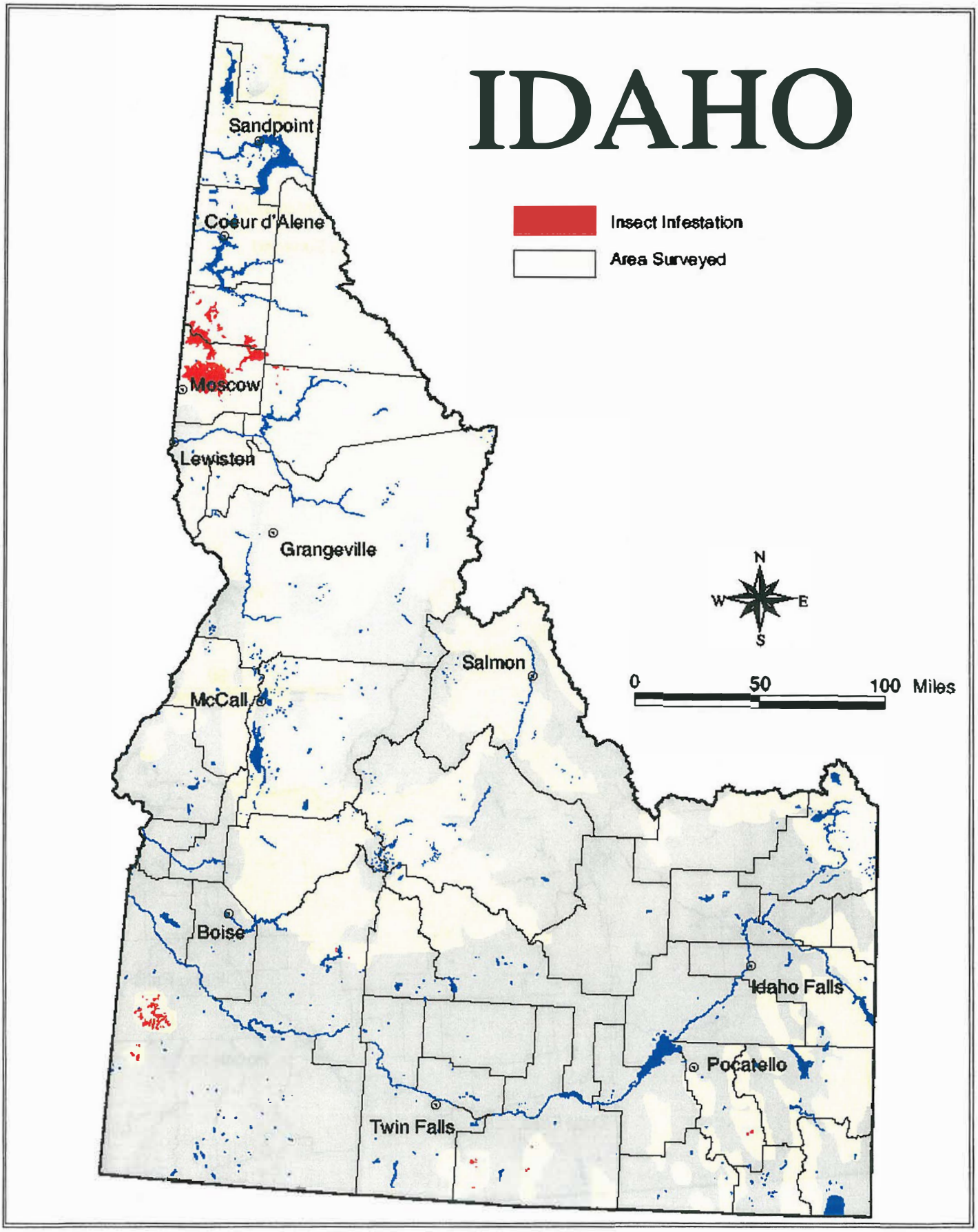
Map 01-6 Areas of Fir engraver infestations in Idaho in 2001



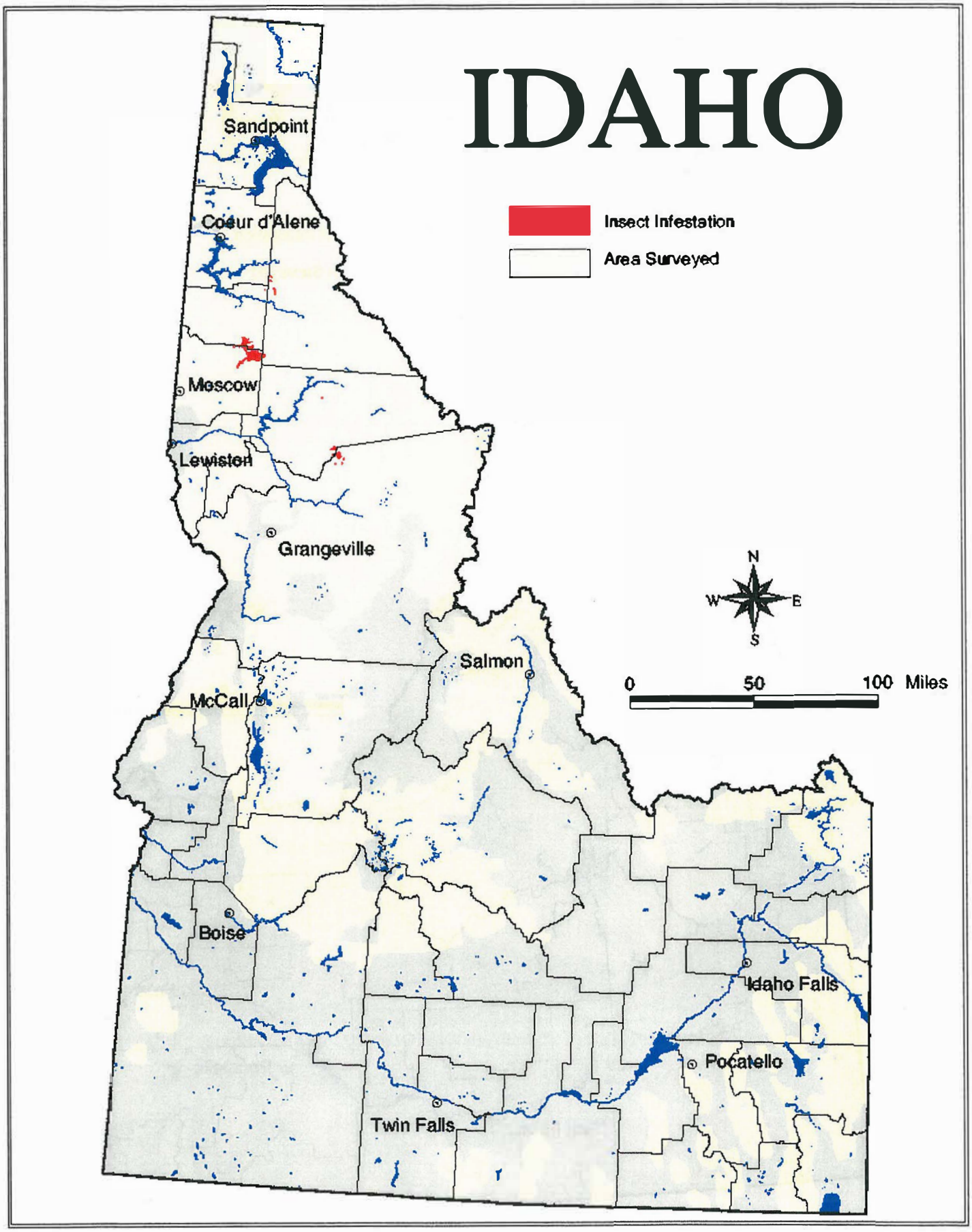
Map 01-7 Areas of Western balsam bark beetle infestations in Idaho in 2001



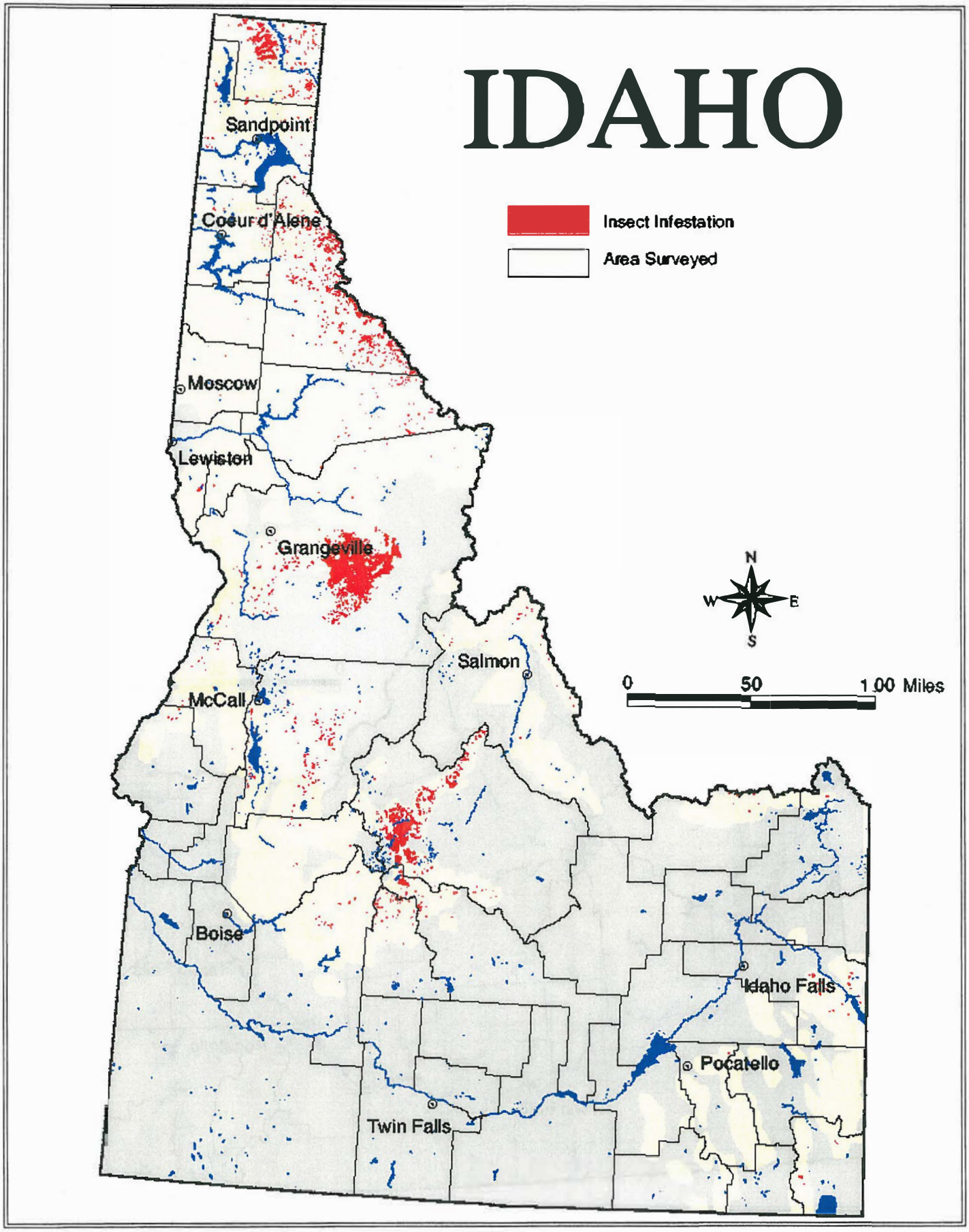
Map 01-8 Areas of Balsam woolly adelgid infestations in Idaho in 2001



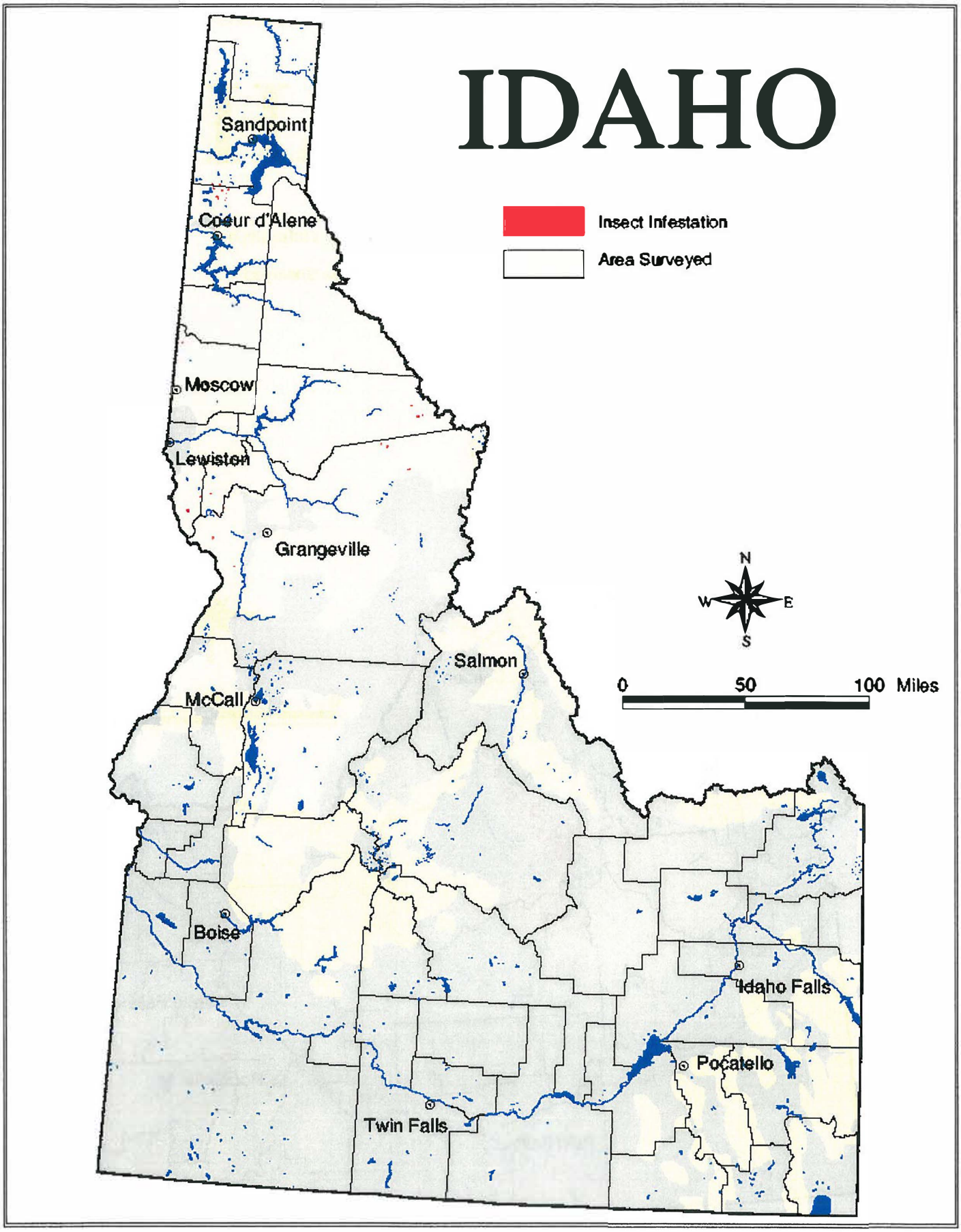
Map 01-9 Areas of Douglas-fir tussock moth infestations in Idaho in 2001



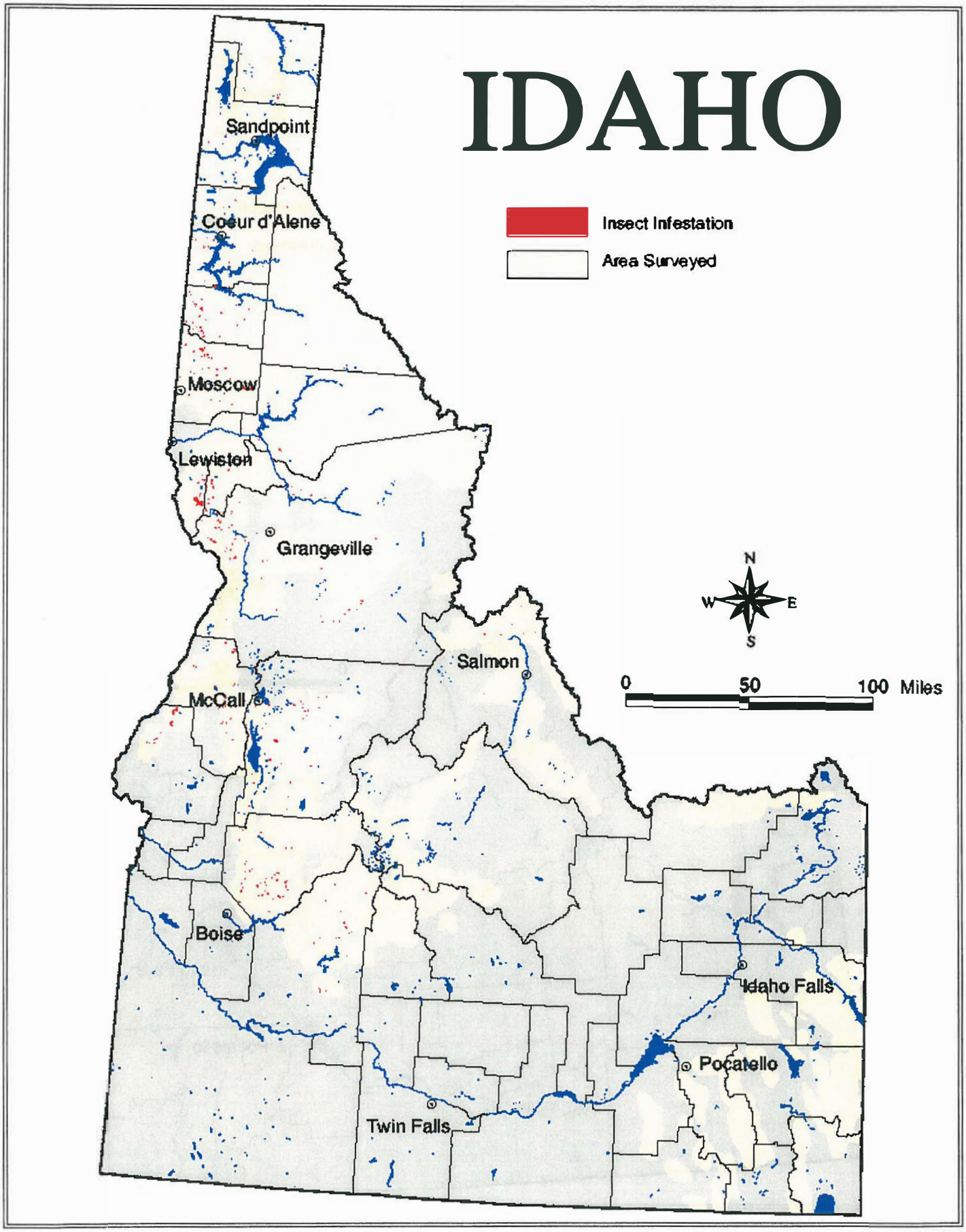
Map 01-10 Areas of Hemlock Looper infestations in Idaho in 2001



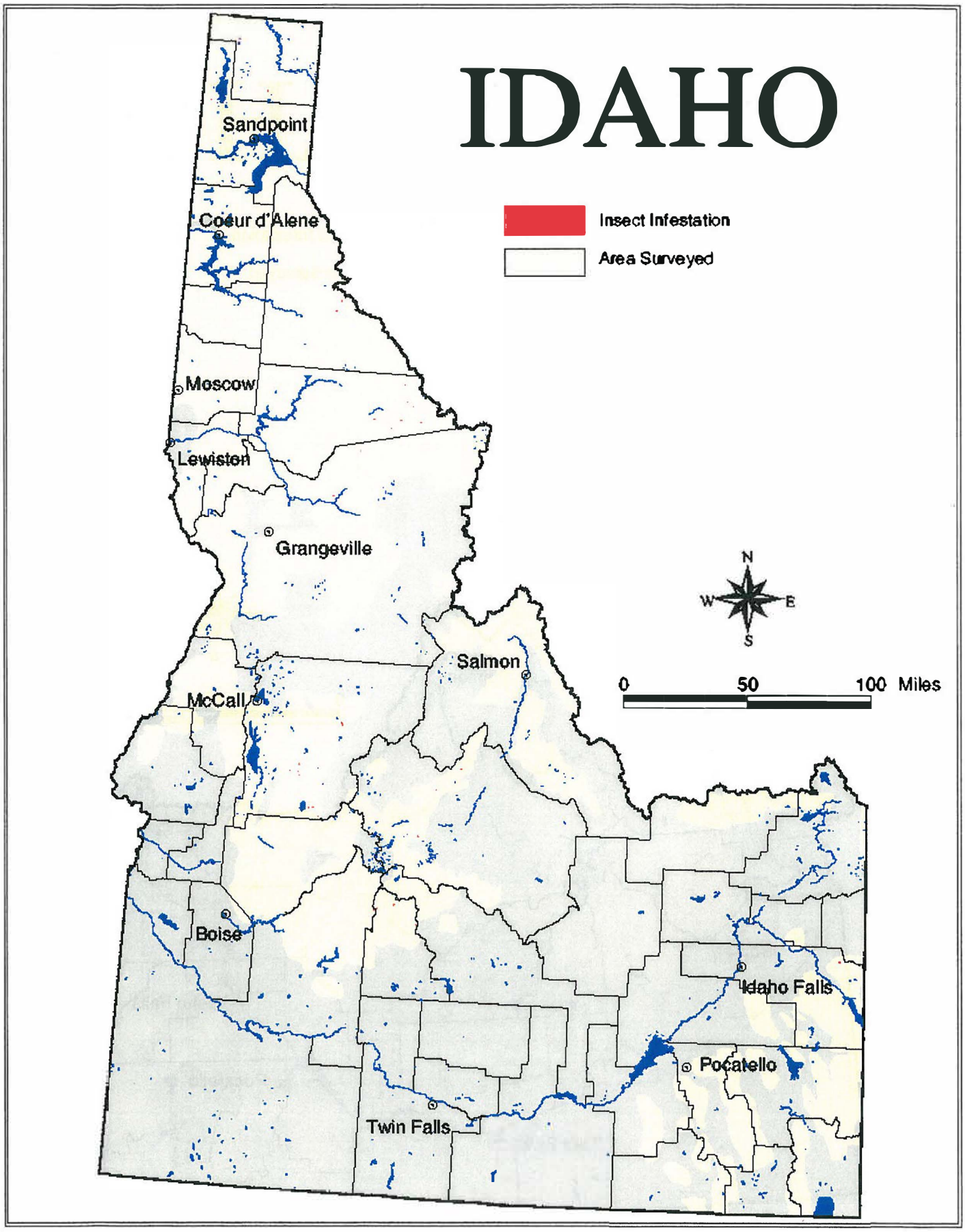
Map 02-1 Areas of Mountain pine beetle infestations in Idaho in 2002



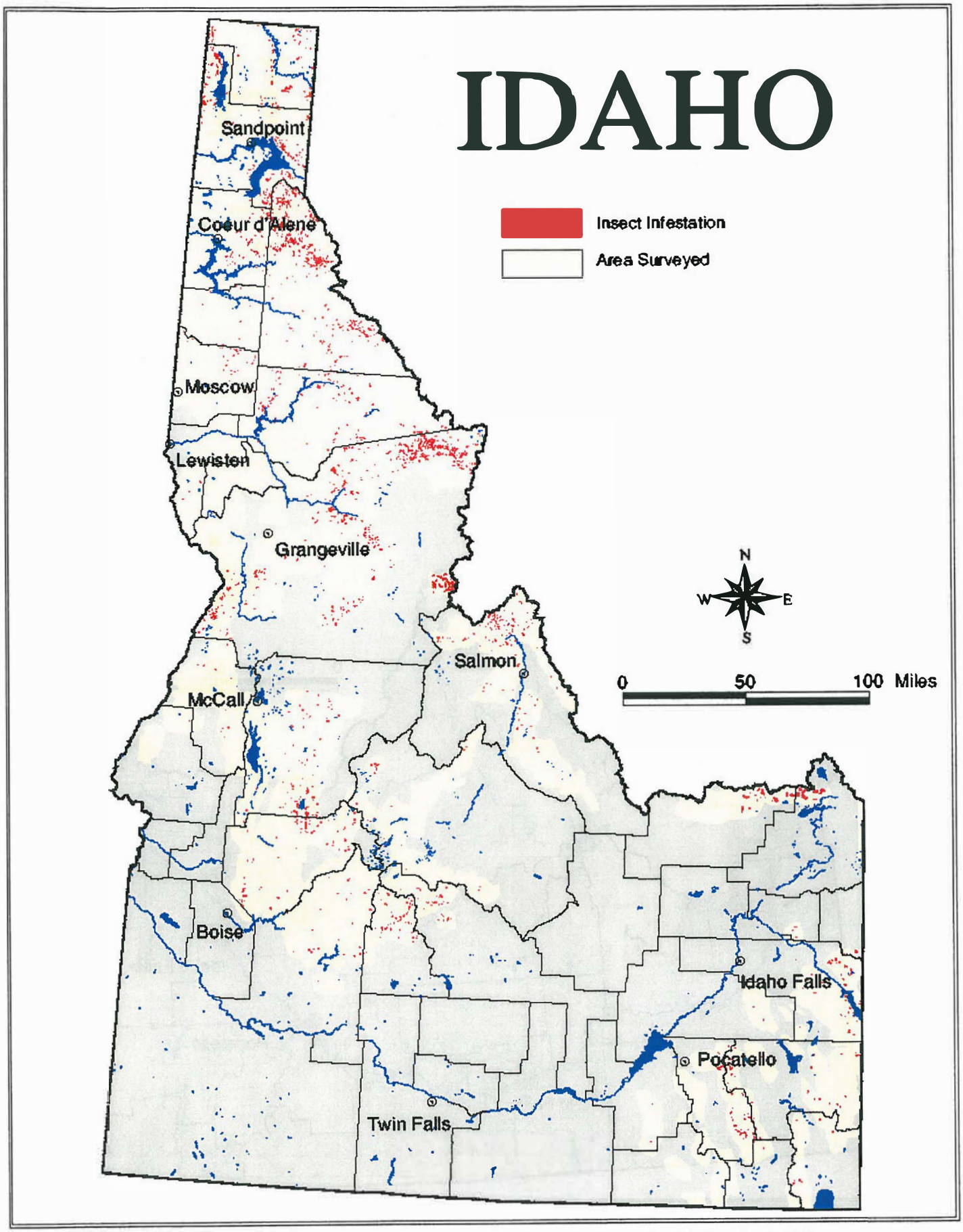
Map 02-2 Areas of Pine engraver beetle infestations in Idaho in 2002



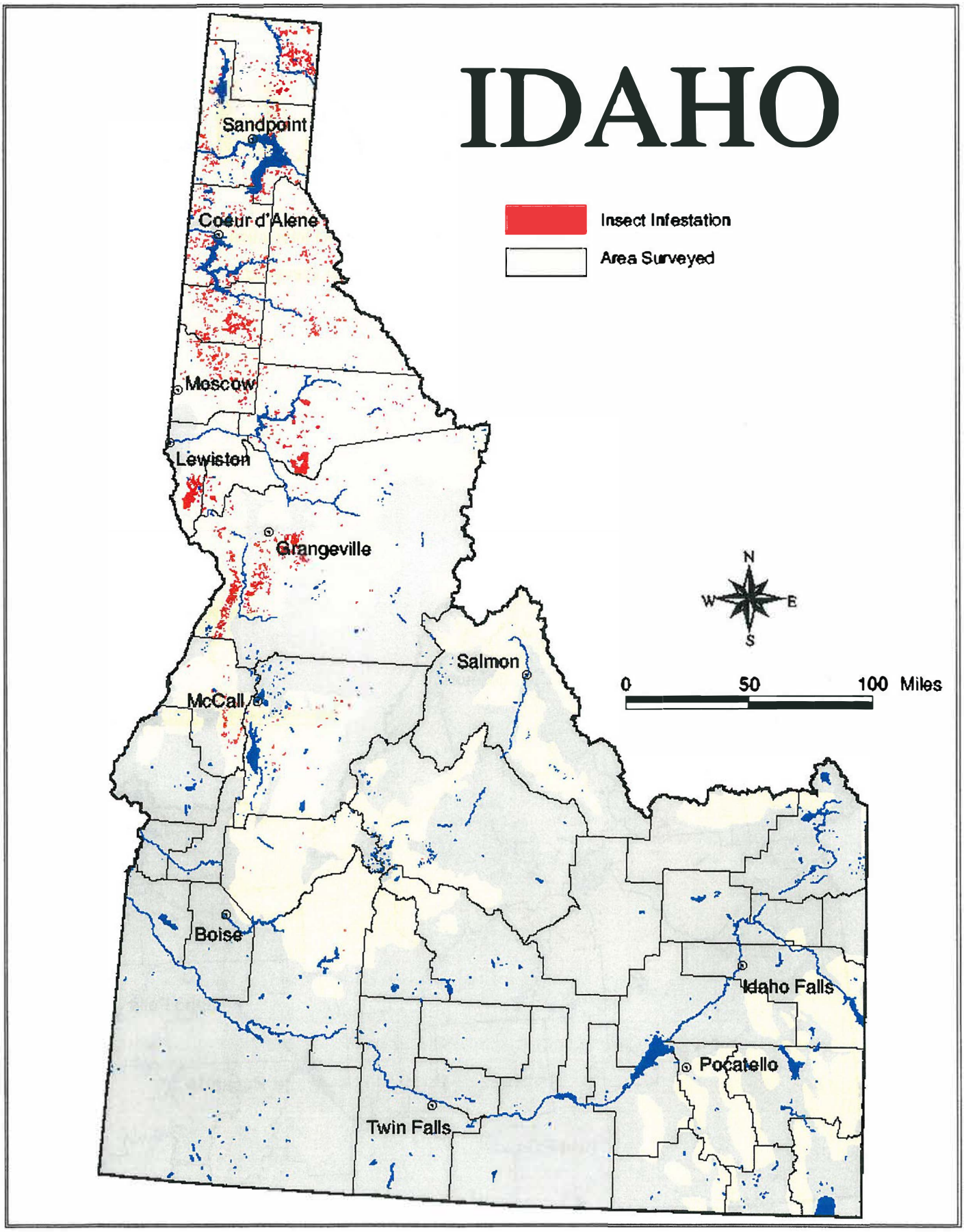
Map 02-3 Areas of Western pine beetle infestations in Idaho in 2002



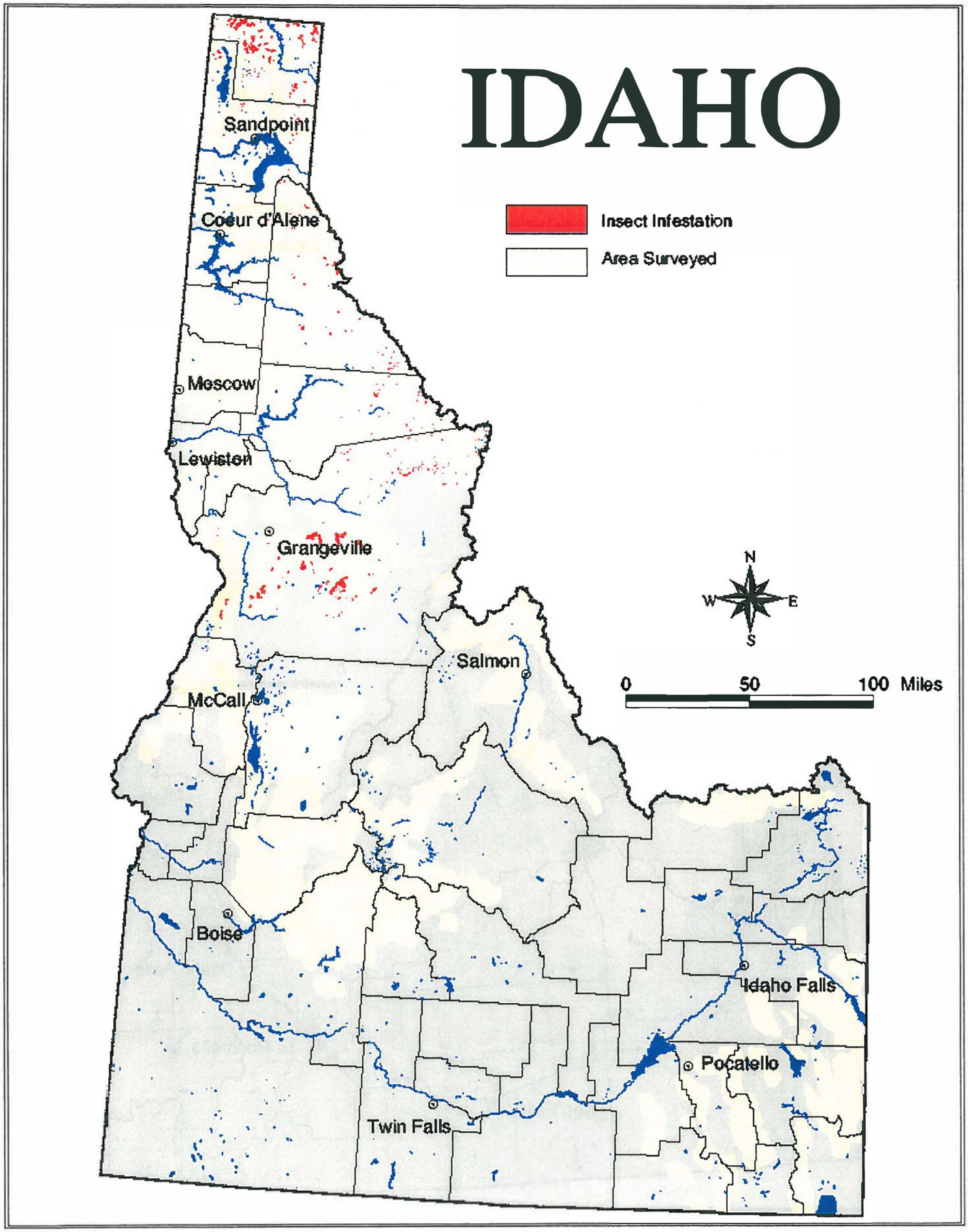
Map 02-4 Areas of Spruce beetle infestations in Idaho in 2002



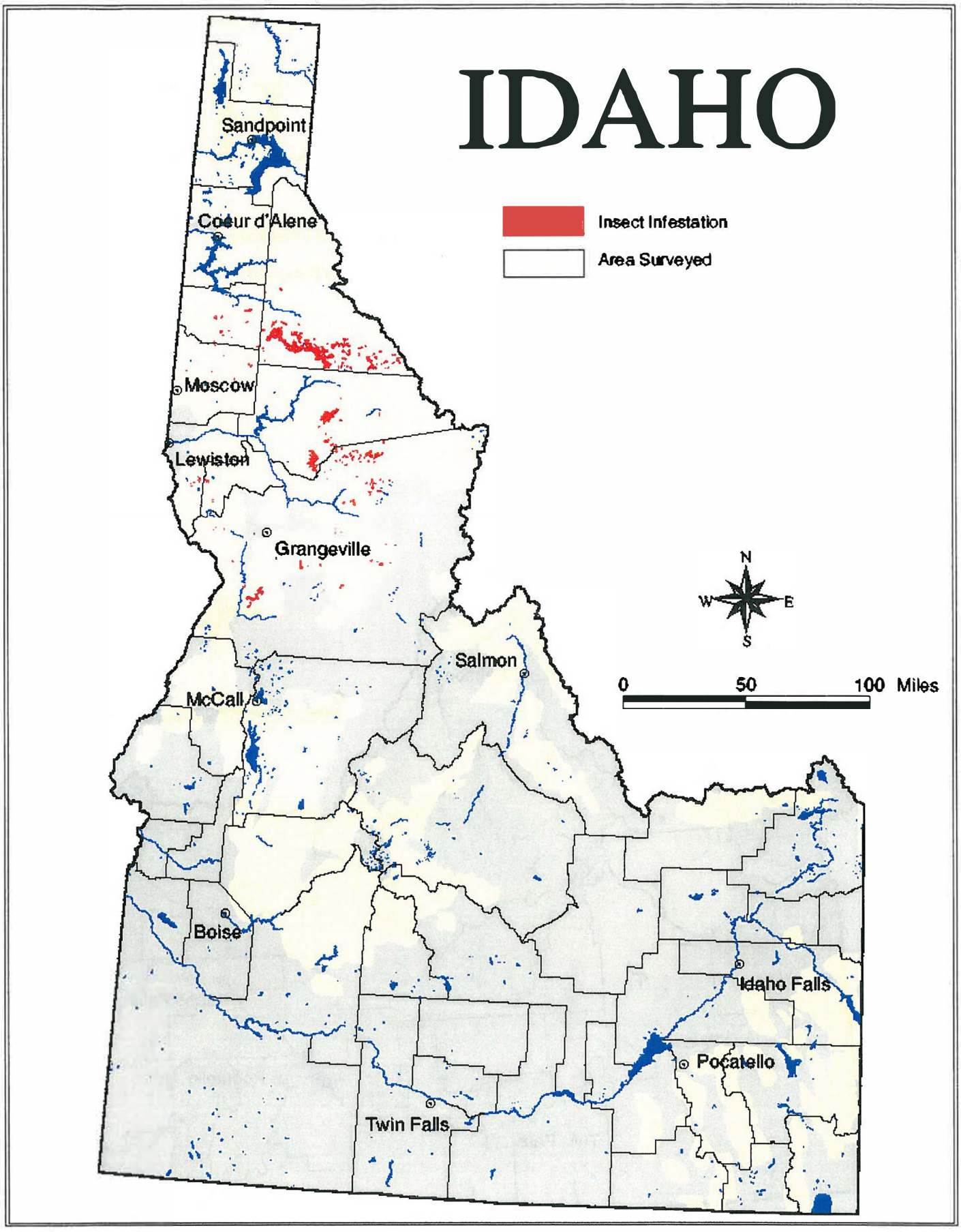
Map 02-5 Areas of Douglas-fir beetle infestations in Idaho in 2002



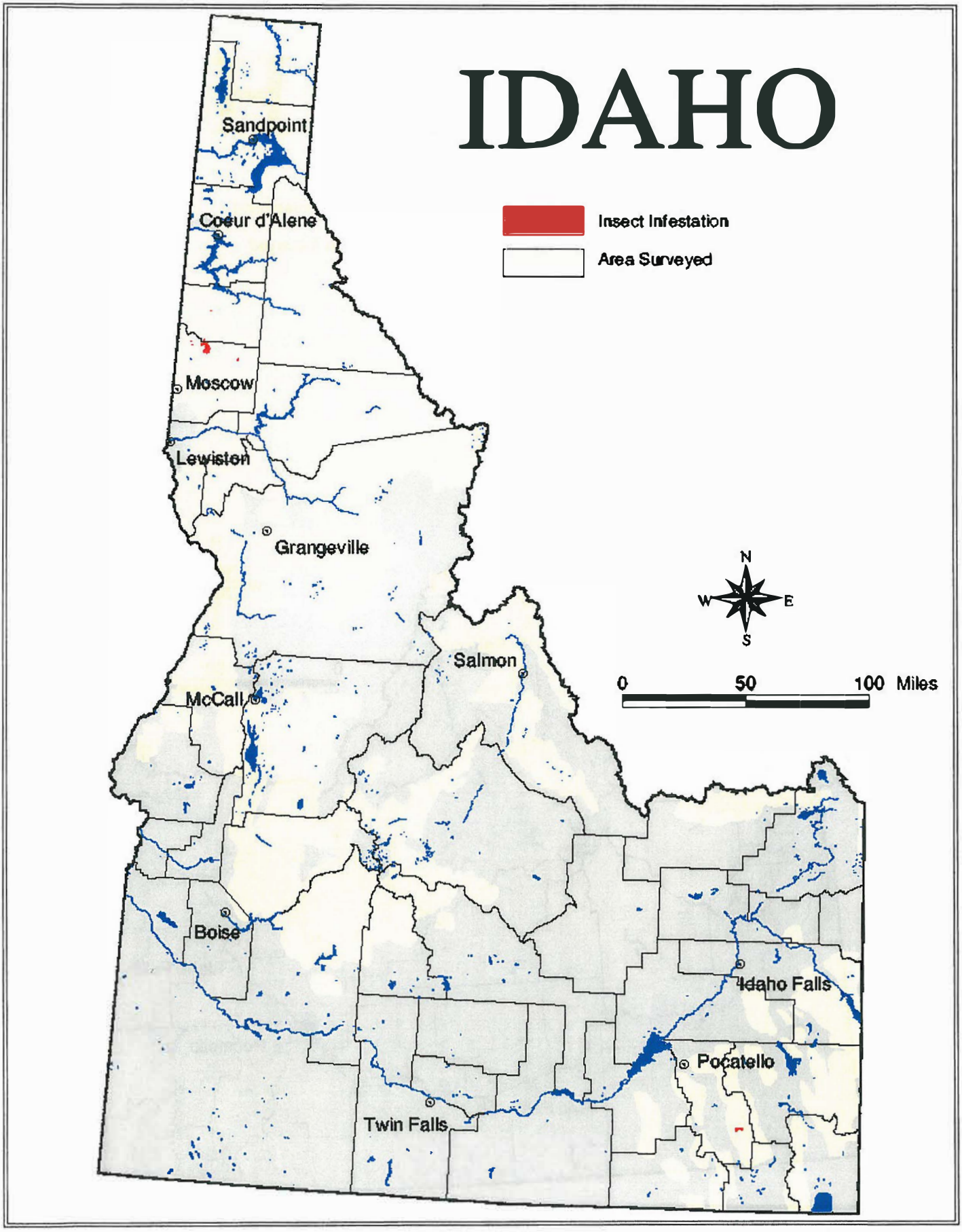
Map 02-6 Areas of Fir engraver beetle infestations in Idaho in 2002



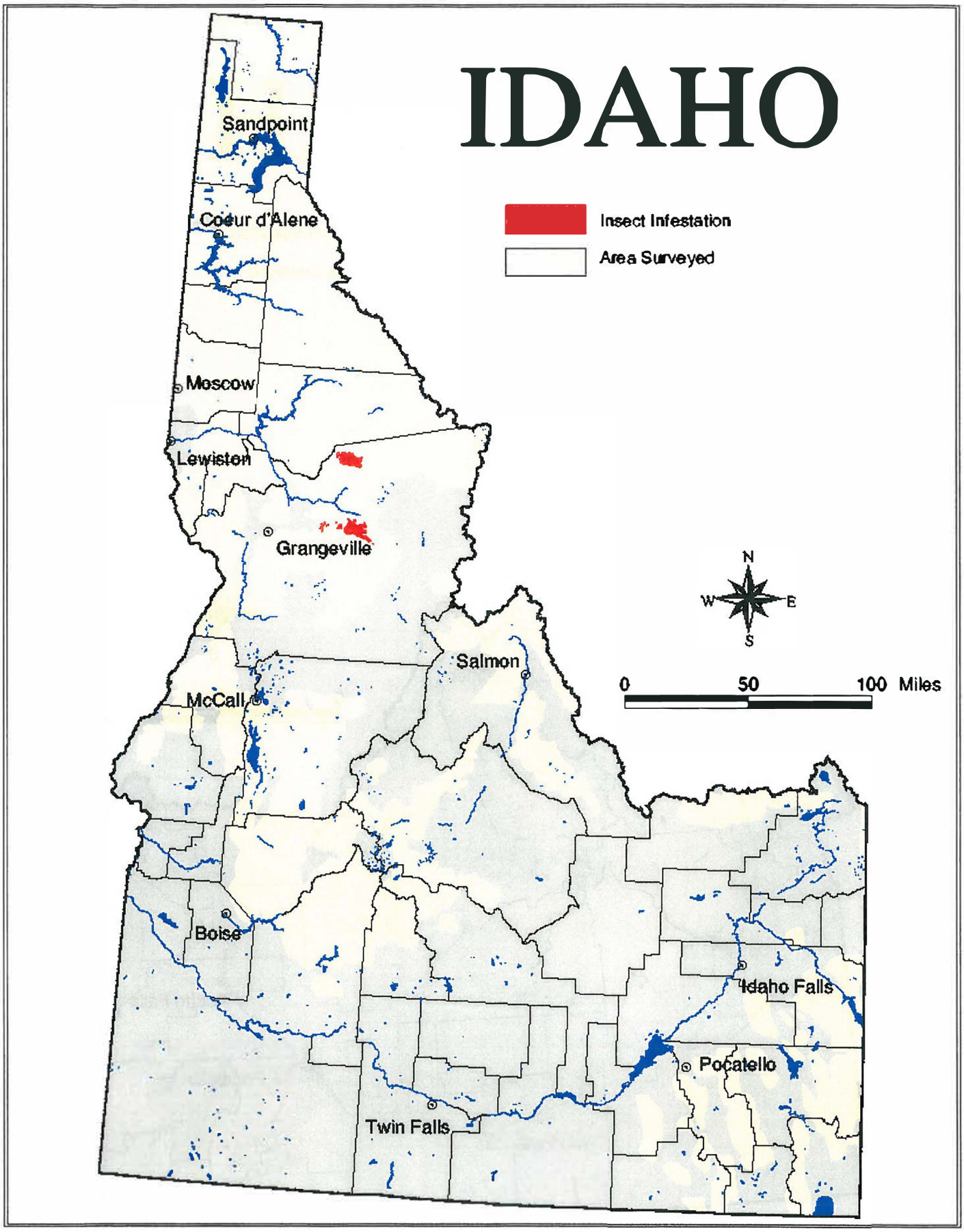
Map 02-7 Areas of Western balsam bark beetle infestations in Idaho in 2002



Map 02-8 Areas of Balsam Woolly Adelgid infestations in Idaho in 2002



Map 02-9 Areas of Douglas-fir Tussock Moth infestations in Idaho in 2002



Map 02-10 Areas of Hemlock Looper infestations in Idaho in 2002